SKYWAYS

The Air Navy's All-Weather Warriors

. . . page 10

J-179 9-52
UNIV OF ILL LIBR
CHICAGO UNDERGRAD D V
NAVY PIER
CHICAGO 11 ILL

YOU'RE NEVER FAR

From a Flying Red Horse!

On short hops or cross-country flights it's good to know you're always within range of that famous sign of quality and performance—the Sign of the Flying Red Horse!

When you use Mobilgas Aircraft and Mobiloil Aero you can be sure of dependable performance under all flying conditions. Get the best you can buy for *your* plane. Land regularly at the Sign of the Flying Red Horse!

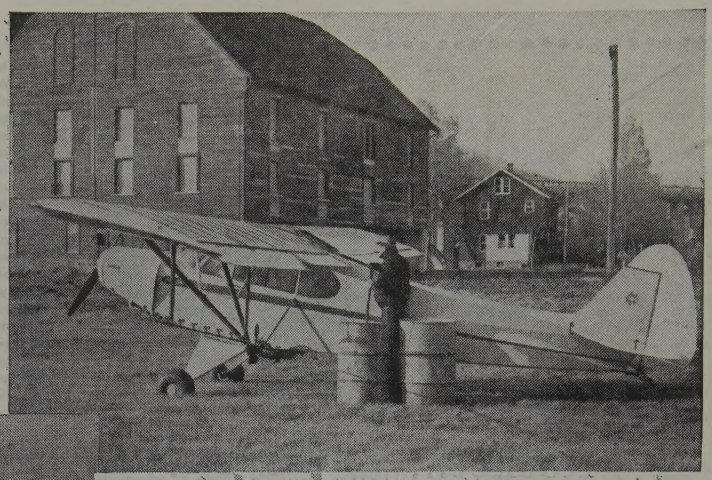
SOCONY-VACUUM OIL COMPANY, INC., and Affiliates:
MAGNOLIA PETROLEUM COMPANY,
GENERAL PETROLEUM CORPORATION

Why Accept Anything Less?

Mobilgas AIRCRAFT

Mobiloil AERO

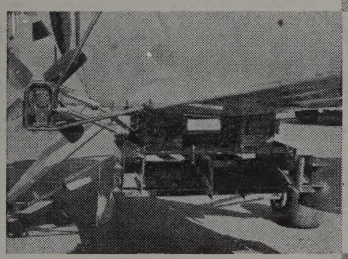
For the Most Efficient and Economical Application of Agricultural Chemicals



PIPER PA-18-A
duster and sprayer

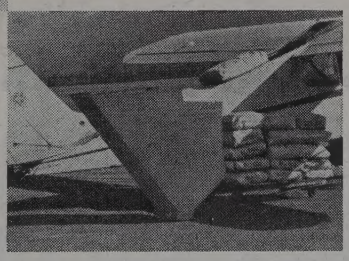
YOU'LL FIND THESE IMPORTANT FEATURES IN THE PIPER PA-18-A

"FLOATING BOOMS" release and swing back if hit for safety and damage reduction. Twenty-four highest quality nozzles, with positive, quick shut-off, give uniform 50 foot swath at one-half to five gallons per acre. Pilot can regulate pressure from cockpit.



SLOTTED VENTURI. Double-gated venturi, with lateral flow dispersal plates, plus flaps, gives deep, penetrating coverage in wide swath. Rugged, heavy-duty agitator assures hundreds of hours trouble-free use with uniform flow and no clogging.

BIG HOPPER holds 18 cu. ft. of dust or 110 gals. of liquid and is removable. Large tight-sealing hatch and reinforced turtle-deck expedite loading. Change from duster to sprayer takes less than 2 man-hours. PA-18-A with half ton load takes off in 315 ft.



Hundreds of veteran agricultural pilots gave their advice; Piper engineers spent long months perfecting desirable features; hundreds of flight test hours were flown to develop better dispersal equipment.

Out of this exhaustive program, Piper now introduces the new Piper PA-18-A—available as a duster, sprayer or combination unit to apply agricultural chemicals for pest control, weed eradication, seeding, fertilizing, defoliating and many other uses.

With the same sensational performance as the famous Piper Super Cub, the PA-18-A will operate with half-ton load from unusually small fields and at exceptionally high altitudes. So much more economical and reliable than surplus aircraft; one-tenth the cost of rotary-wing machines; safer and much more efficient, the new PA-18-A applies chemicals at far less cost per acre.

Complete details on the PA-18-A are available in new brochure. Write for your copy to Dept. 2-K.

PIPER AIRCRAFT CORPORATION

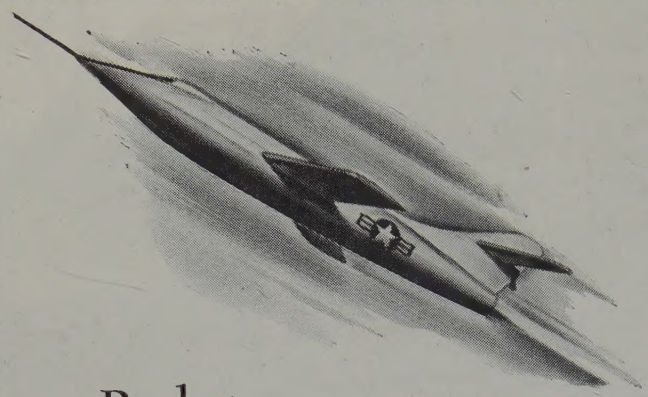
LOCK HAVEN, PENNSYLVANIA

OTHER IMPORTANT FEATURES: Shoulder harness • • Wire Cutters on landing gear • Easy-to-read liquid-level gauge • Removable metal fuselage belly • Excellent visibility • Non-flammable Duraclad finish • 125 horsepower Lycoming engine • Metal propeller • Baggage compartment • 35 to 120 mph speed range • Flaps

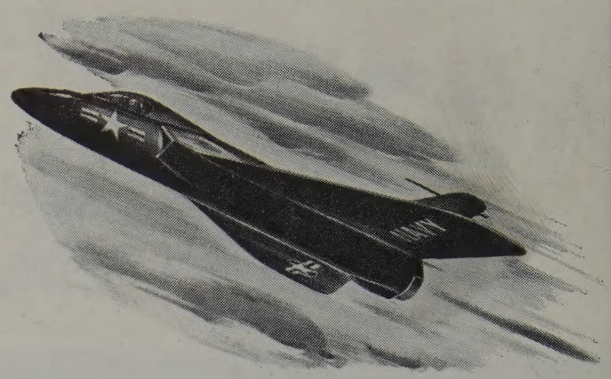
SUPER CUB UTILITY MODEL. Piper also offers the standard Super Cub with 47-gallon external tank for spraying. Leaves both seats usable for general utility flying. Tank and booms easily removable when not spraying.

The speckled patterns above are actual size spray drops laid down on test paper at 80 mph for coverage of two gallons per acre.

Vol. 11, No. 2, February, 1952, SKYWAYS is published monthly by Henry Publishing Co., 444 Madison Ave., New York 22, N. Y. Printed in U.S.A. Single copy 25 cents. Subscription Prices: U. S., possessions, Canada and Pan.-Am. Union $7.00 for three years, $5.00 for two years, $3.00 for one year; all other countries add $1.50 per year for postage. Six weeks required for address changes (give both old and new address.) Manuscripts, drawings, other material must be accompanied by stamped, self-addressed envelope. SKYWAYS is not responsible for unsolicited materials. Reentered as second-class matter April 16, 1948, at the post office at New York, N. Y. under the act of March 3, 1879. Copyright 1952 by Henry Publishing Co.



Rocket... World famed Navy-Douglas 558-2 *Skyrocket*, which, on August 7, 1951, set new world records for speed and altitude for airplanes of any type or size.



Jet... Designed for intercepting high-flying supersonic enemy planes, the F4D *Skyray* is an advanced-type bat-wing jet, developed by Douglas for the U. S. Navy.

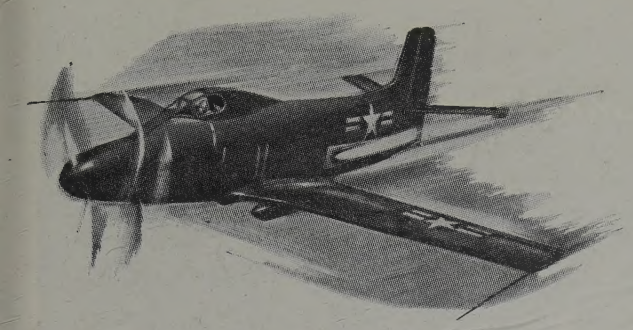
Only Douglas leads in

Advance-type Douglas military and commercial aircraft are in service today... You can depend on Douglas for the new "miracle" planes to come!

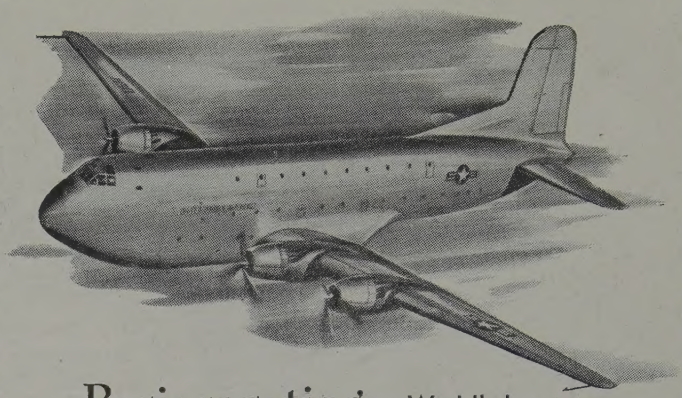
SINCE 1920...FIRST AROUND THE WORLD!

Douglas **Cloudster**, first airplane to lift its own weight in payload • Douglas **M-1**, first U.S. mail plane • **Torpedo 1**, world's first torpedo plane • **C-1**, world's first cargo plane • DWC **World Cruiser**, first to fly around the world • **DC-1**, prototype of famed DC-3 (C-47) • A-20 **Havoc**, famous World War II light bomber • A-26 (B-26 **Invader**), first 400 mph attack bomber • DC-4 (C-54) **Skymaster**, first 4-engine global transport • **SBD**, Navy attack bomber that stopped the Japs at Midway • AD **Skyraider**, Navy attack bomber, now fighting in Korea • **C-74**, largest World War II transport • C-124 **Globemaster II**, largest cargo transport in production • **DC-6** and DC-6A **Liftmaster**, first post-war modern transports • F3D **Skyknight**, first Navy jet night fighter • D558-1 **Skystreak**, first Navy transonic research airplane.

WORLD'S LARGEST BUILDER OF AIRCRAFT FOR 32 YEARS ➛ MILITARY AND COMMERCIAL TRANSPORTS FIGHTERS ➛ BOMBERS ➛ GUIDED MISSILES ➛ ELECTRONIC EQUIPMENT ➛ RESEARCH AND DEVELOPMENT



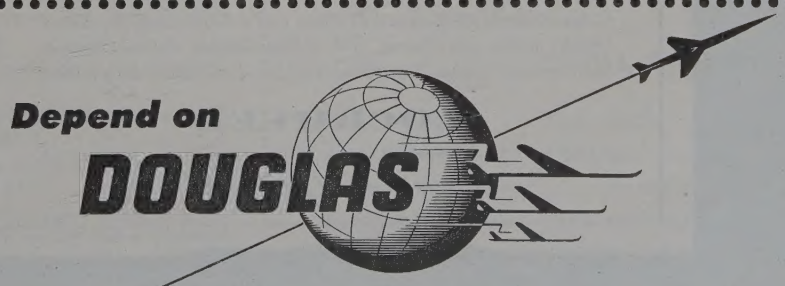
Turbo-prop... First U. S. turbo-prop attack bomber, the A2D *Skyshark*, built for the U. S. Navy and now entering production at El Segundo Division of Douglas.



Reciprocating... World's largest cargo transport now in volume production. It's the C-124 *Globemaster II*, designed to support global operations of the military.

all four power types...

From the DC-3 to the *Skyrocket*—fastest airplane ever built—Douglas has pioneered remarkable advances in every phase of the art of flight. Undisputed leader in the design and production of the finest in transport airplanes, Douglas has also developed basic airframe types to embrace the three new powers: turbo-prop, jet and rocket. *Douglas is the only manufacturer that has built and flown all four aircraft types!* Certainly this is a tribute to the foresight and creative engineering skills of the Douglas organization. Today, as Douglas continues to mass-produce the aircraft needed *now*, research and engineering teams push ahead in every field of aeronautics . . . planning the "miracle" planes that will supersede the near-miracle planes of today. Douglas Aircraft Company, Inc., Santa Monica, California.



First in Aviation

Leadership demands constant achievement

Lockheed Presents The

Super Constellation

An even finer version of the World's Most Experienced Airliner

Lockheed's new Super Constellation combines the unmatched record of experience and dependability of the world-famous Constellation with greater speed, greater range, greater comfort and greater size—unquestionably the finest airliner in the world.

Now in service for Eastern Air Lines and soon in service for Trans World Airlines, Air France, K.L.M. Royal Dutch Airlines, Pakistan International, Qantas, Trans-Canada Air Lines, and other leading airlines.

LOCKHEED

AIRCRAFT CORPORATION, BURBANK, CALIFORNIA

Look to Lockheed for Leadership

Lockheed

BOOSTS PROFITS FOR AIR CARGO OPERATORS

Air freight traffic has increased 467% since 1946, continues to grow at a rapid clip. During this period, Lockheed engineers worked steadily on the problems created by this fast-growing business and have come up with much-needed developments.

Some of these developments were recently previewed by airline executives and military officials in a 3-day seminar held at Burbank. It was revealed that Lockheed (1) has a new Super Constellation cargo plane designed to reduce freight-carrying costs, and (2) has thoroughly analyzed the problems of loading, tying down, unloading and handling of freight at airports. One exhibit was Lockheed's mechanically operated scale model of "the ideal air cargo terminal," which has attracted national attention.

The new Super Constellation cargo plane is the most highly mechanized freight carrier yet designed. Some of its outstanding advantages:

1. Solves major interior handling problems with three exclusive features: an all-metal (magnesium) floor, a built-in mechanical conveyor, and a portable, airborne cargo elevator of 10,000 pounds capacity.
2. Carries "more cargo farther and faster" than any other airplane.
3. Increases carrying capacity, both in total floor space and weight.
4. Guarantees greater profits because of its low direct operating cost—actually 4.9 cents per ton-mile.

The Super Constellation is the result of a decade of air cargo research at Lockheed. It combines the experience and dependability of the world-famous Constellation transport with greater size and greater operating economy.

It is 18.4 feet longer than the standard Constellation.

It will carry 38,500 pounds, or nearly 20 tons, across the nation.

It will carry over 25,000 pounds, non-stop from New York to Paris.

It has net usable space totaling 5,568 cubic feet, equal to nearly three standard railroad refrigerator cars.

And its metal watertight floor permits much heavier load limits (300 lbs. per sq. ft. or 1000 lbs. per running ft.), higher density cargo and a wider variety of cargo.

Military versions of this airplane already have been ordered in large numbers for both the Air Force and the Navy.

SKYWAYS

February, 1952

Cover: Goodrich Co. Lodestar

Air Navy's All-Weather Warriors — H. Levy, W. Shipp — 10
Sailors in Skyraiders secure the coasts of the U.S.

No Wings and a Prayer — Lt. C. B. Smith, USN — 13
Ejector-seat training is what this pilot got in the end

The Long Way Is Shorter — H. A. Gurney — 14
Pressure-pattern flying proves pilot aid on long X-C's

Combat Chasers — George Charles — 16
Civilian lightplanes became excellent military bird-doggers

Props Are Not Expendable — Gilbert C. Close — 18
Maintenance hints for propellers on small private planes

Pilot's Report: FD-25 — Don Downie — 21
Here's a military lightplane packed with power and pilot favor

Turbines for Small Planes — C. B. Bachle — 22
The day of the jet-powered business plane is not far off

Flying the Map — Frank L. Harvey — 24
There's extra safety in knowing how to navigate via map

Gen. "Ike's" Eagle — M/Sgt Don Weber — 26
Major Wm. Draper handles the "Connie's" controls for Gen. Eisenhower

Dilbert — S. H. Warner & Robt. Osborn — 28
A good pilot knows the cockpit by heart . . . and he doesn't miss

Exec-Plane Schedules — E. Gardner — 30
Company aviation departments make sure the boss' plane is ready

Flying Pharmacist — Eliot Tozer — 32
E. R. Squibb & Sons' plane and crew add push to company sales

Mixing Amplifier — Harvey A. Senior — 34
ARC Isolation Amplifier eases radio headache of pilot and co-pilot

Skyways for Business — 36
News notes of the business world of aircraft operation

NAVICOM

RTCC Operation Progresses in Washington — 61

VOICE Identifies Pilot's Position — 63

Air Your Views — 7 — Military Aviation — 8

CAOA Report — 38

J. FRED HENRY . . . Editor and Publisher

D. N. AHNSTROM . . . . Managing Editor DON DOWNIE . . . . . Western Editor

CHARLES W. ADAMS . . . . Art Director STANLEY M. COOK . . Production Manager

PEGGY N. YAMRON . . Asst. Art Director ARTHUR KAPLAN . . . Circulation Director

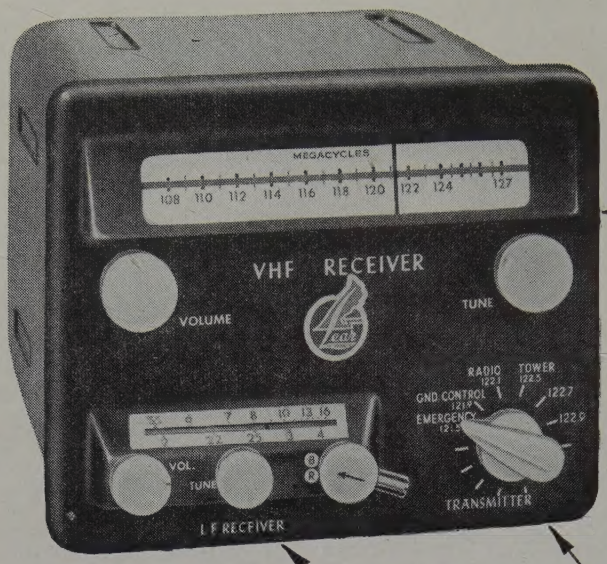
BENNETT H. HORCHLER . Advertising Director

FEBRUARY 1952 VOLUME 11, NUMBER 2

Henry Publishing Co. publishes SKYWAYS at 444 Madison Avenue, New York 22, New York. Advertising Offices; 444 Madison Avenue, New York 22, N. Y.; 6 N. Michigan Ave., Chicago 2, Ill.; 816 W. 5th Street, Los Angeles 17, Calif. Gordon Simpson, West Coast Manager. Thomas W. Bryant, Jr., Chicago Manager.

The following publications are combined with SKYWAYS: Air News and Flying Sportsman.

All rights to these names are reserved by Henry Publishing Co.



NOW it's the Lear LTRA-6

...better 22 ways!

VHF RECEIVER

New type high-stability tuner... maintains greater accuracy of calibration... better signal-to-noise ratio... stabilizes pip indications in Lear Omniscope®

New low-noise input circuit... brings in weak signals with far greater effectiveness... provides greatly enhanced sensitivity

More effective noise limiter circuit to suppress ignition disturbances

Improved frequency stability

Improved immunity to generator noise

Illuminated slide-rule dial

Provisions for dimmer control

Angle presentation for better visibility

VHF TRANSMITTER

Transmits on 12 frequencies (2 crystals supplied)

Improved audio fidelity

Plug-in crystals for easy accessibility

LOW FREQUENCY RECEIVER

Improved sensitivity

Improved image rejection to help eliminate undesired signals

More uniform volume control

Marker beacon muting circuit

Antenna compensator to meet variations in installation... insuring optimum performance

Angle presentation of dial for better visibility

Illuminated slide-rule dial

Provisions for dimmer control

The LTRA-6 also offers continuous, instantaneous, and automatic magnetic bearings for omnirange navigation when used with Lear Omniscope® and Omnipack®... enables you to fly the ILS runway localizer and VAR visual-aural ranges when used with the Lear VCIX indicator and VCA adapter... provides static-free, telephone-clear VHF reception and transmission... contains a marker beacon receiver. For more information on this great new *rugged* product of the Lear development laboratories, see your Lear distributor or write:

LEAR INC.
11916 WEST PICO BOULEVARD • LOS ANGELES 64, CALIFORNIA

AIR YOUR VIEWS

One-Man 'Copter

Gentlemen:

In your December issue you have a picture of a one-man helicopter. We are wondering whether or not you could give us any information about its inventor and the machine's specifications. It would be nice to know that his address is not some local hospital in Asnieres.

R. W. JOHNSTON

Farmingdale, N. J.

Gentlemen:

I am a little skeptical about that one-man helicopter pictured in the December issue. If you are allowed to give out information on this machine, I'd appreciate knowing its speed, rate of climb, and rpm.

E. M. BRUECK

Fort Wayne, Indiana

Monsieur Raymond Haussteter's one-man 'copter intrigues a lot of our readers. We haven't any additional information about it right now, but we expect to have details in the near future. Our correspondent in Europe is going to track down the intrepid inventor.—ED.

F-97

Gentlemen:

At a recent air show at Luke AFB, Arizona, pamphlets were given out which showed pictures of Air Force jets. Among them was a photo of an F-97. I have never heard of an F-97. What is it?

BILL RUSTON

Phoenix, Arizona

A good question Mr. Ruston. Apparently not much publicity has been given that designation. It is the production version of the Lockheed F-94B, a two-place all-weather interceptor powered by a Pratt & Whitney J-48 turbojet.—ED.

Married Cadet

Gentlemen:

In your November issue you have a caption under one of the pictures that tells of an Aviation Cadet waving goodbye to his wife before he leaves on a cross-country flight. I thought Aviation Cadets had to be single and were not allowed to be married until they graduated.

E. RUKAVINA

Rochester, Minn.

We thought so, too, Miss Rukavina, and so your letter was sent to the powers-that-be for a reply. Here's what we got back: "If some Air Force fledgling has been telling some charming young lady that he can't marry until he gets his silver wings and gold bars, he's not just pulling her leg. This is what happened in the case of Cadet Phillipp: During a trial period in 1949, married men could apply for training in the Air Force. Then in October of the same year, single status again became mandatory. Married men who had qualified prior to the 'cut-off' date retained their eligibilty, and in some cases were not called to begin Aviation Cadet training until a year later. This time element, plus the full year required to complete training, explains the presence of married cadets during 1951. Since October of 1949, all applicants have been required to sign a statement that they are single and shall remain so until graduated or discharged from the cadet program." Guess that explains everything for both of us, Miss Rukavina.—ED.

BT-13A

Gentlemen:

Always read your magazine with interest and with even more so when in answer to M. Aikens of Ogden, Utah, 170 mph was stated as the cruising speed for a BT-13A. Now the "old bucket of bolts" I had was a damned good BT, but it never saw 170 mph even at full throttle in level flight! Maybe she had gotten a little tired after 10 years and countless beatings from air cadets and myself.

J. EVERHARD

Altadena, Calif.

Guess our informant had his BT in a dive, power, that is. At any rate, the consensus of opinion sides with you, Mr. Everhard. The BT-13 doesn't cruise at 170 mph, despite the fact that performance figures credit it with that speed. Would 140-mph cruise be more in line?—ED.

Promotion

Gentlemen:

Re. the sub-head under the title of my article, "A Pilot's Viewpoint," I appreciate that nice promotion, but I am a co-pilot and have been for six years. I was in the last captains' class on my airline and, with some 30 other pilots, am carried as "Checked out to Reserve Captain status but not promoted from First Officer." That sounds pretty good, but unfortunately, no matter how you slice it, I'm still a co-pilot!

W. A. DIXON

Overland Park, Kan.

Specs Wanted

Gentlemen:

I would like to know the specs of the Dassault *Ouragan*, Supermarine *Sea Attacker*, Bristol *Brigand*, Avro *Lincoln*, and Aeronca L-16.

JOHN MARTIN

Rochester, N. Y.

The Dassault Ouragan (Hurricane) *is a single-seat interceptor powered by Hispano-Suiza* Nene *turbojet engine. It has a wing span of 40 feet 4 inches, is 35 feet 3 inches long, and has an empty weight of 9,500 pounds. Its top speed is 600 mph at sea level. The Supermarine* Sea Attacker *is a Royal Navy fighter powered by a Rolls Royce* Nene *turbojet engine. It has a wing span of 36 feet 11 inches, is 37 feet 6 inches in length. It has a top speed of 583 mph at 10,000 feet, and a range of 1,190 miles with drop tanks. The Bristol* Brigand *is a three-place long-range attack plane suitable for dive bombing, mine laying, or day or night fighting. It is powered by two Bristol* Centaurus *radial engines, each rated at 2,470 hp for take-off. It has a wing span of 72 feet 4 inches, is 46 feet 5 inches in length. It has a cruising speed of 311 mph at 23,000 feet, and a still-air range of 2800 miles. The Avro* Lincoln *is a scaled-up version of the World War II* Lancaster *bomber. Classified as heavy bomber, the* Lincoln *is powered by four Rolls Royce* Merlin *engines, each rated at 1,760 hp. It carries a crew of seven, has a cruising speed of 230 mph at 20,000 feet and a normal range (with 14,000-pound bomb load) of 2,250 miles. It has a wing span of 120 feet, is 78 feet 3 inches in length. The Aeronca L-16 is the military version of the Aeronca* Champion. *It is powered by 90-hp Continental engine, has a cruising speed of 100 mph and a range of 350 miles at cruising.*—ED.

Two-Seat Trainers

Gentlemen:

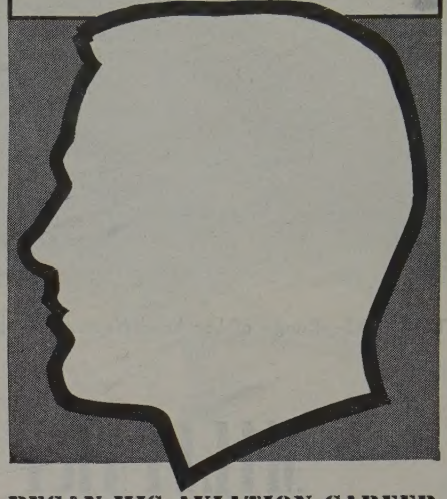
I disagree with you in your July issue, page 35, because all trainers are two-seaters.

B. MYERS

Memphis, Tenn.

This discussion seems to be over a picture of the Air Navy's T0-1. In this case, Mr. Myers, the TO-1 is a single-seater trainer version of the F-80C. The two-place jet trainer is the T0-2, the Air Navy's version of the T-33 two-place trainer version of the F-80C.—ED.

HIGH SCHOOL GRADUATE
BILL SMITH



BEGAN HIS AVIATION CAREER AT *Northrop*

Here is a typical case history of a Northrop student. It could be yours!

Bill Smith graduated from high school. Being interested in aviation, he sent for the catalog of Northrop Aeronautical Institute.

Bill's Northrop catalog gave him important facts about aviation careers.

The catalog showed him that Northrop trained men get *interesting, high-paying jobs* as Aeronautical Engineers or Aircraft & Engine Mechanics immediately upon graduation. It showed him the *unlimited future* of aviation—the great and growing demand for Northrop trained men throughout this entire *essential industry.* It gave him a preview of the courses he would take, the advanced technical equipment he would use, and the exciting aeronautical environment at Northrop Field.

Bill immediately realized the extra advantages Northrop training offers!

As a Northrop engineering graduate, he will always benefit from the prestige of the famous Northrop name. He can qualify educationally for Air Force Cadet, Officer Candidate, or Naval Aviation Cadet. Wherever he goes—in civilian or military life—Northrop training can be his passport to opportunity and success!

Make the same wise decision as Bill Smith—TRAIN AT NORTHROP!

The decision you make *today* may decisively affect your entire future! Regardless of your present status, find out about Northrop aviation training and an aviation career!

Northrop
Aeronautical Institute
1521 E. Broadway, Hawthorne, Los Angeles County, Calif.
Approved for Veterans
WRITE TODAY FOR FULL INFORMATION

NORTHROP AERONAUTICAL INSTITUTE
1521 E. Broadway, Hawthorne, Los Angeles County, Calif.

Please send me immediately the Northrop catalog, special military information and employment data, and schedule of starting dates of classes. I am interested in:

☐ Aeronautical Engineering ★ Aircraft & Engine Mechanics ☐

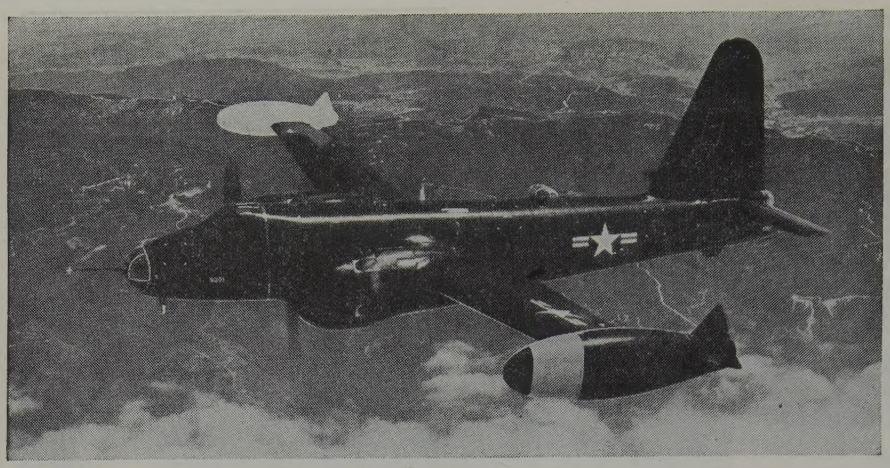
Name_____ Age____

Address_____

City_____ Zone____ State____

☐ VETERANS—Check here if you are entitled to training benefits under the G. I. Bill

5N4



TIPTANKS—Range of Lockheed *Neptune* has been extended by new center-mounted drums

MILITARY AVIATION

MATS

New head of Military Air Transport Service is Major General Joseph Smith. He succeeds Lieutenant General Laurence S. Kuter who has been assigned to U. S. Air Force Headquarters as Deputy Chief of Staff, Personnel. Gen. Kuter had been MATS commander since the formation of the service in June, 1948.

Jet Starter

A self-starter, about the size of a standard typewriter, has been developed for jet-plane engines. Developed by Bendix Aviation Corporation, the new starter packs a 380-hp wallop, enough to out-pull two Cadillac cars, and weighs just 75 pounds. With it, it takes just three seconds to bring a powerful jet engine to starting speed. Then it cuts out and the engine is "on its own" within 10 seconds. The new starter was designed for the *Sapphire*, and eliminates the use of ground crew and bulky ground equipment for jet-engine starting.

Scorpion Order

A production order has been awarded Northrop Aircraft for quantity output of the new F-89D. Latest version of the all-weather *Scorpion*, the F-89D is equipped with high-speed rockets that pack a destructive punch so tremendous that a single hit on even the largest modern bomber is considered a virtually certain kill. Coupled with this punch is the F-89D's electronic aiming and automatic triggering equipment which enables the pilot to direct his fire with pin-point accuracy. The F-89D is powered by two Allison jet engines, has speed in excess of 600 mph and an operational altitude above 40,000 feet.

'Round-The-World Jet

The Lockheed T-33 two-place trainer is now used by more countries than any other type of jet plane. At the present time, T-33's are flying in Canada, France, Turkey and Greece, while negotiations are underway for delivery of Lockheed T-33's to other countries, among them Portugal. The ship is used by friendly nations to train their military pilots to handle turbine power.

Marine Trophy

In ceremonies at Floyd Bennett Field, Brooklyn, N. Y., recently, Marine Fighter Squadron 132 was honored as the nation's top Marine Air Reserve Squadron. A silver trophy, awarded annually to the squadron with the highest safety and drill attendance record for the year, was presented to Maj. John Musselman, Jr., commanding officer of VMF-132 by Brig. Gen. Jerome. One of the most distinguished fighter squadrons in Marine Aviation during World War II, VMF-132 has been operating as part of the Organized Marine Reserve since 1946.

Tiptank Test

Lockheed P2V *Neptunes* recently completed a six-month tiptank test program which resulted in the development of a finned, center-mounted type tiptank. Fins on the tanks steer them clear of the plane when they are dropped. According to Lockheed engineers, these new tanks actually give the anti-sub *Neptune* improved lateral stability. New Navy *Neptunes* will carry enlarged tanks holding either fuel, radar or searchlight. Earlier varieties, originated by Lockheed on the F-80, were hung beneath the wing instead of being center-mounted. For test purposes the tiptanks were painted.

All-Weather Oil System

Another development to aid in getting planes into the air faster in sub-zero temperatures is an oil system brought out by United Aircraft Products, Inc. Called a "diverter segregator finned hopper" system, it eliminates the present practice of using ground heaters to heat the oil system prior to take-off in zero and sub-zero temperatures. During the process of starting an aircraft engine, a limited amount of heat is created due to the combustion of the gasoline in the engine. This heat is transmitted to the lubricating oil being forced through the engine. When this slightly warmed oil is recirculated to the supply oil tank, a heat transfer surface (fins) specially designed and adapted to an aircraft tank by UAP, transmits this heat to the frozen oil. The frozen oil decongeals in a minimum of time. This new all-weather oil system was originally designed for the B-36, but can be adapted to fit any reciprocating engine.

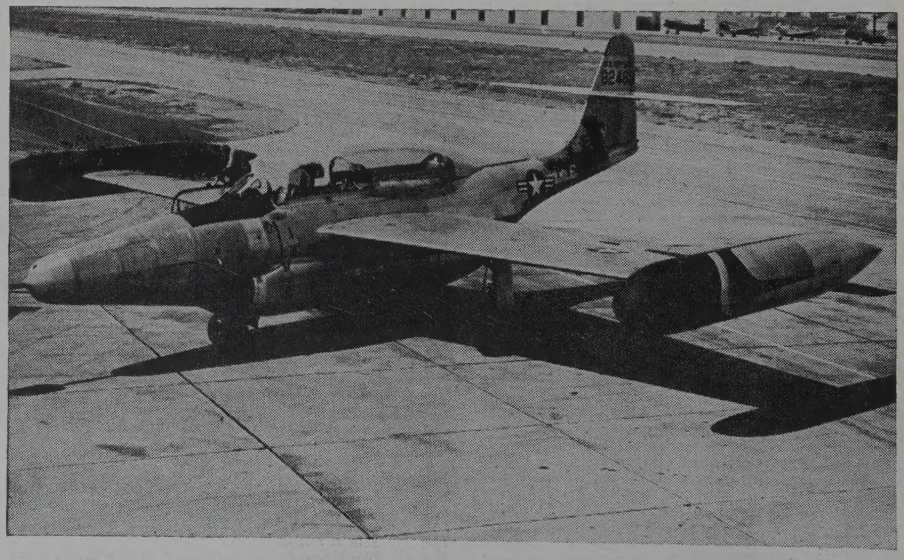
News Notes

CHRYSLER has begun construction of its new plant for the building of the Navy's new J-48 jet engine. The new plant, located at Detroit, is scheduled for operation by early 1953.

GENERAL MOTORS plans to be in volume production on a Grumman Navy fighter, the sweptwing F9F, at its new plant in Arlington, Texas, by mid-1953.

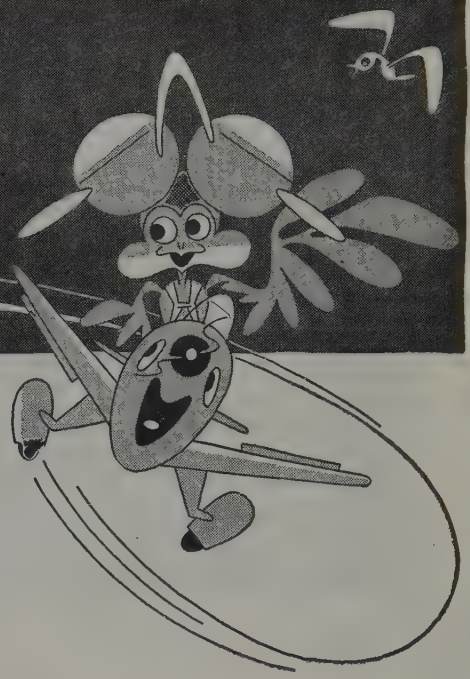
GLENN L. MARTIN CO. has begun reoccupation of the government-owned plant utilized during World War II for B-26 production. Plant is located on Martin Airport, Baltimore, Md.

DOUGLAS AIRCRAFT reports its X-3 research plane is ready to fly. It is powered by a Westinghouse J-40 engine, and is expected to attain speeds greater than that of the D-558-11. Bill Bridgeman will be the pilot.



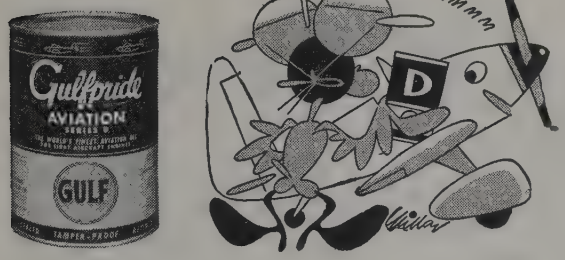
D MODEL—Latest version of *Scorpion* is this F-89D, here being readied for flight

What's the right oil for *your* airplane engine?



You've heard so much about aircraft oils you probably want to know which one is best for *your own engine.* Good idea. You'll fly more safely, no matter what type of engine your plane has, if you use the *right* oil for your engine type. For example:

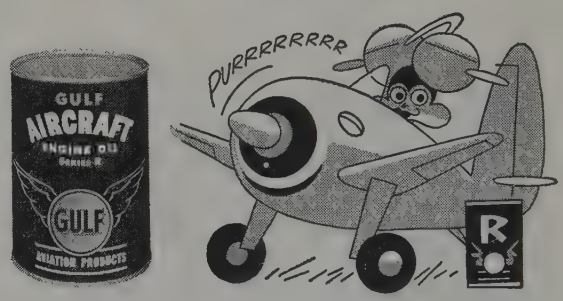
Horizontally opposed engines need Gulfpride Aviation Oil Series-D!



Here's the world's finest detergent-dispersant aviation oil. It's made *exclusively* for use in horizontally opposed engines. Because it is put through Gulf's exclusive Alchlor Process to remove extra amounts of carbon-and-sludge formers, Gulfpride Aviation Oil, Series-D, prevents ring and valve sticking . . . maintains a cleaner, better operating condition longer.

Actually, users have increased periods between engine overhauls as much as 100% with this great oil!

For radial engines or where a detergent oil is not desired, use Gulf Aircraft Engine Oil Series-R!



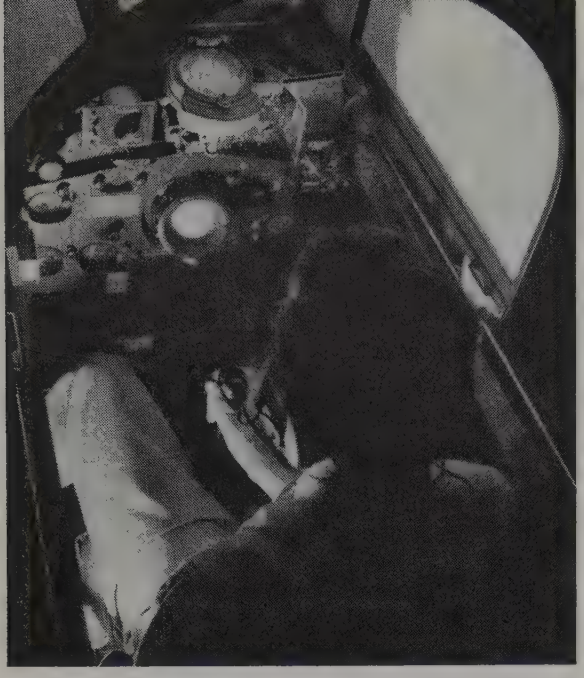
Assures superior performance in radial engines. Especially recommended for maximum operating periods between overhauls, it may also be used in horizontally opposed engines when operating conditions do not require a detergent oil.

A fine-quality, non-detergent, straight mineral oil, Gulf Aircraft Engine Oil, Series-R, is highly effective in retarding sludge formation. Maintains its body at high operating temperatures, too.

GULF
AVIATION PRODUCTS

For More Flying Fun—Don't Settle For Less Than Gulf!

And remember—the Gulf Airgide Directory lists Gulf airport dealer locations and many others throughout the U. S. and Canada. Comes in mighty handy. Get your copy from your Gulf dealer.



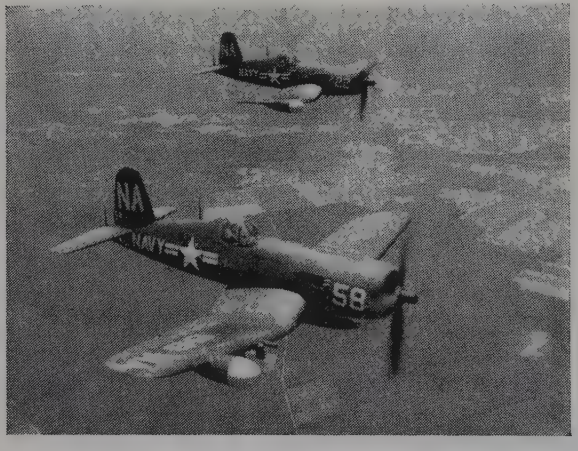
TRAINEE sits at controls of Radar Link Trainer. Note radarscope on which would appear all target indications

CONTROLLER at trainer panel is Lt. Geary, VC-4 pilot. He controls course of "target," watches action on scope

Air Navy's All-Weather Warriors

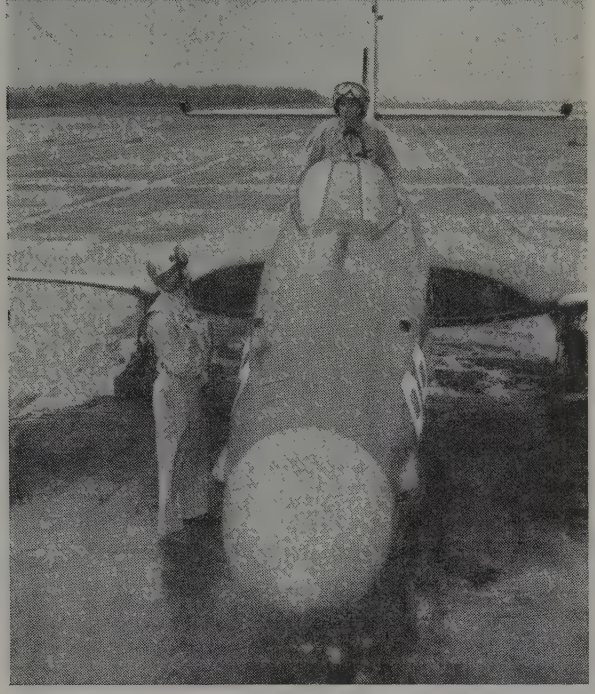
By H. LEVY, W. SHIPP

Navy's All-Weather airmen keep sharp eye out for foe



VC-4 PILOTS fly *Corsair,* night-fighter version. White-nosed "tank" on starboard wing contains interceptor radar

ALL-WEATHER JET used by VC-4 is radar-equipped F2H-2N *Banshee (below).* Elongated nose houses radar equipment



SKIPPER of VC-4, Capt. Booth (in *Banshee* cockpit), talks over details with his Executive Officer before taking off

JET TEAM checks wall map before taking off on all-weather training mission from Naval Air Station at Atlantic City

ONLY ONE sequence of letters could adequately describe the weather—s-t-i-n-k-o! A nicer word would suggest nicer weather, and there was none of that. It was cold, foggy, and rainy—a bone chilling wetness that made you think of a dozen places a lot more comfortable than this and wish you could be in any one of them.

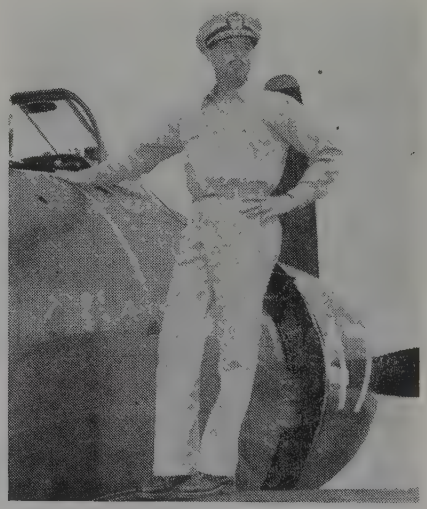
We were standing in front of the hangar at the Naval Air Station, Atlantic City, watching the ground crews readying several *Corsairs* and *Banshees* for a night flight. Upstairs in the ready room the pilots were being briefed and having their hot coffee and doughnuts. They belong to the Navy's All-Weather Squadrons, and to them "all weather" has a far greater meaning than the term implies. Training and experience prepare these boys for tactical operations in all weather in all climates in all parts of the world and at any time of the day or night. "All-Weather" is truly all-inclusive.

The All-Weather squadrons, as we know them today, are a specialized development of the night-fighters that had their beginning in the middle years of World War II. "Butch" O'Hare was the Navy's first night-fighter pilot—he was killed in an attempted night intercept in November, 1943, in the days when eating raw carrots and wearing dark goggles before a night flight were thought to be necessary.

Heretofore, all Navy pilots received night-flight training, but to this there now has been added all-weather flying. Before reporting to the fleet, each Navy pilot is schooled in the techniques of both all-weather operation *and* night flying.

Of the two operational all-weather squadrons based at the Fleet Air Detachment at Atlantic City, Composite Squadron Four (VC-4) has as its primary mission the destruction of enemy aircraft under *any* weather condition. All of its other assignments are secondary, but still relative to and a component of the achievement of its primary mission. Commissioned in 1948, VC-4 is a pioneer in all-weather operations, and it supplies all-weather fighter planes and pilots to each aircraft carrier. VC-4 may have detachments operating with

COMMANDING OFFICER of VC-33 is Cmdr. R. M. Lindsey, on wing of an AD-4Q



SQUADRON administrative officer is Lt. Cmdr. K. D. Smith, a VC-4 jet *Banshee* pilot

the Atlantic Fleet or in Korea, while at the same time it may have other detachments in Argentina, Newfoundland, undergoing cold-weather operations. But wherever their scene of operation, the all-weather boys from VC-4 are among the best trained in the business.

The doctrine of VC-4, to "learn to fly right at the beginning and you will automatically always fly right," has been so deeply integrated into each phase of the A-W training, that it is not just an idealistic apothegm—it is an everyday actuality in evident existence. VC-4 accumulates more flying time each month than any other operational squadron on the East Coast, much of it at night or on instruments.

Along with the development of special techniques for all-weather operations, VC-4 also concerns itself with the modification of existing aircraft to meet specialized requirements. While some modifications may be made at the base, those of major import are made by the manufacturers on the basis of tests and recommendations of the operating personnel of VC-4.

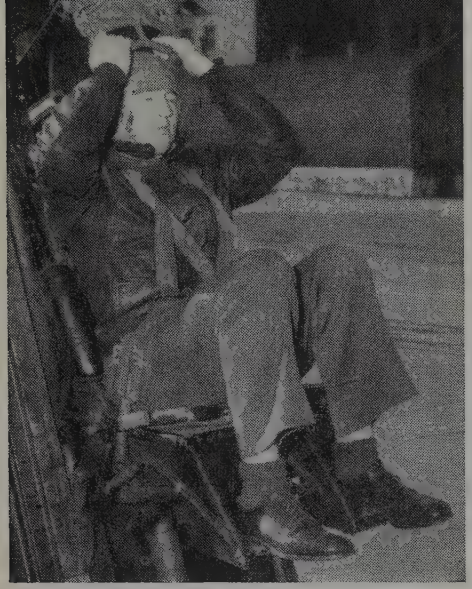
We find in daily use the old and still top-flight night-fighter version of the piston-engined Vought *Corsair*. It has been winterized or "all-weathered" by the addition of de-icer boots on the wings and tail surfaces, a de-icer propeller, over-sized heater, extra oxygen, windshield de-icers, etc. Powered by 2500-hp Pratt & Whitney R-2800-32 engine, this single-place fighter has a top speed in excess of 450 mph. An airborne interceptor radar unit is housed in a large bulbous projection on the starboard wing, and a droppable fuel tank located under the fuselage increases the *Corsair's* range. This plane is fitted with two separate and identical radios, one for emergency use should the main radio go out. The antenna for this second radio juts up out of the rear of the fuselage just aft of the trailing edge of the rudder. Designated F4U-5NL, this *Corsair* carries four 20-mm cannon mounted in the leading edge of the wings.

The jet all-weather fighter used by VC-4 is the McDonnell F2H-2N, a radar-equipped version of the *Banshee*. This craft is basically the F2H-2, but the nose has been elongated to house the radar, and larger, non-jettisonable wing-tip tanks have been installed to extend its range. Power is supplied by two Westinghouse J-34-WE-34 axial flow turbojet engine of 3,000 pounds thrust each. The *Banshee* has a ceiling in excess of 40,000 feet, and speed in excess of 600 mph.

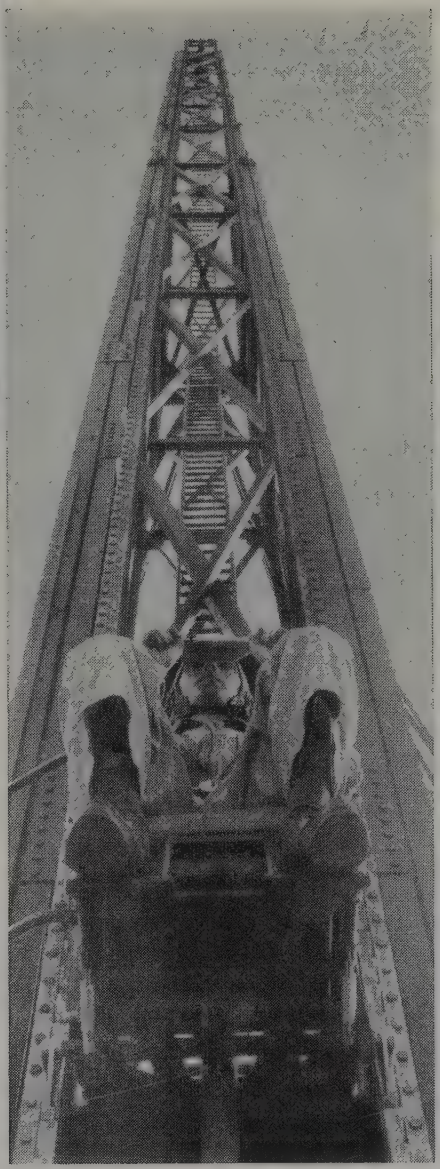
The *Corsair* and the *Banshee* used by VC-4 are merely modified night fighters, and as such have some limitations. The pilots, therefore, are eagerly awaiting delivery of the Douglas *Skynight*, the two-place twin-jet F3D designed specifically as an all-weather fighter. Even now, F3D-1's are in active service with several of (*Continued on page 40*)

BEECH SNB-3Q is used for training Douglas AD crewmen. The "blisters" on plane's nose and underbelly house part of its extensive electronic countermeasuring equipment

HOT LANDING is registered here by Lt. Cmdr. Smith in his #95 *Banshee*. Note smoke from "burning" tires at actual moment of contact with the runway. Lt. Cmdr. Smith leads jet team



NAVY AIRMAN, all set for ejection seat practice, prepares to pull the wind screen down over his face



TRACK up which the pilot will travel when ejector seat is fired is 80 feet high

SHELL, a 37 mm, goes off, seat and pilot go up. Untrained pilot is now trained

No Wings and a Prayer

By LT. C. B. SMITH, USN

RECENT publicity on the use of ejection-seat trainers in the Navy and Air Force makes my back ache a little and reminds me of my experience as one of the first to take the so-called training course. I was a happy and satisfied test pilot in the Flight Test Division of the Naval Air Test Center when the long finger of Fate reached out and touched me, ultimately giving me a push of historical proportions.

In more prosaic language, it was my boss who advised me that my name had been submitted as a volunteer for a ride in an ejection-seat trainer. Frankly, it shook me up. Almost daily, I flew machines equipped with loaded and armed ejection seats and derived a great deal of comfort therefrom. As I understood the arrangements, whenever I felt that it was necessary for an airplane and I to part company, I was to pull or push the necessary gimmicks and be wafted clear of the doomed machine. I did not fool myself. I did not expect to be wafted gently. I expected to get a terrific wallop on my posterior, but I was willing to be philosophical about this. After all, I figured, there's no other way to get out of a high-speed or uncontrollable jet fighter. Besides, I was reared in a "spare the rod, spoil the child" school. Compared to a 250-pound dad, what's a 37-mm shell? But to *practice* getting a wallop on the posterior? It didn't add.

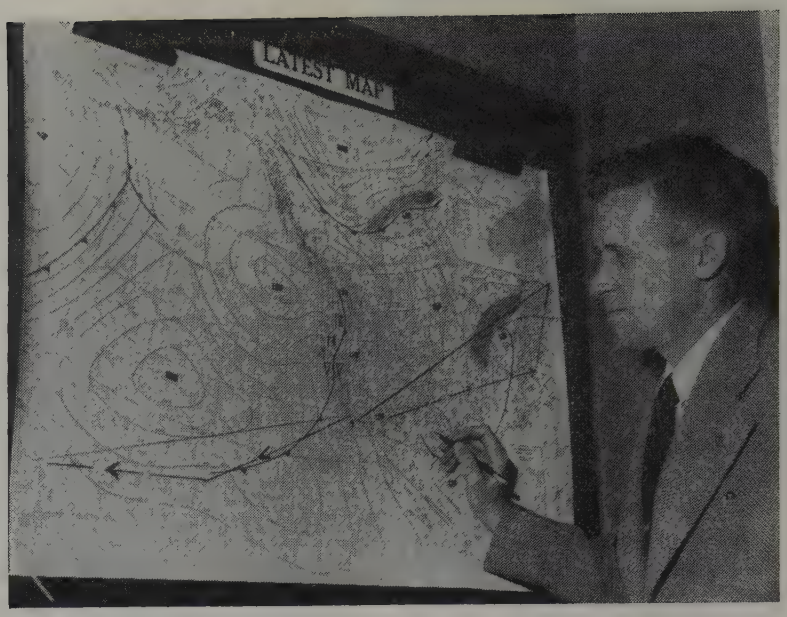
In brief, I was dumbfounded. I felt that it was like practicing Russian roulette before engaging in a match. But when the plane took off for Philadelphia and the ejection-seat trainer, I was aboard with the rest of the volunteers, simulating calmness. I don't like to ride transports.

The first stop on our (*Continued on page 41*)

The Long Way Is Shorter

By H. A. GURNEY

Captain, United Air Lines



FORECASTER Aldrich of Los Angeles points out pressure-pattern route to New York

Pressure-pattern flying is pilot aid on cross-countries. Try it . . . . and get there much quicker

A WHOLE new era of flying has been opened up by pressure-pattern flying and pressurized cabins.

The pilot now has new choices in routing and weather that he never had before. With the new pressurized cabins, he can go over the weather. With pressure-pattern flight planning, he can re-route his long-range trips to have a nearly constant tailwind. Sounds good—and it is!

When the flight crew climbs into the front office of a DC-6 to fly non-stop from Los Angeles to Chicago, they may go as far south as El Paso for the most favorable weather. The return flight may fly almost to the Canadian border. With these round-about routes, we can cut our flight time by many minutes—sometimes even by hours.

Our scheduled DC-6 flight time from Los Angeles to Chicago is six and one half hours. Under ideal pressure-pattern planning, I once made the hop in four hours 42 minutes to establish what was at that time a new commercial record for the flight. The very next day United Captain Eldred Remelin, using the same pressure-pattern technique, knocked two minutes off my flight time. Both flights were made at our normal cruising power settings.

Here's the way this pressure-pattern flying works. In the northern hemisphere, the winds pour counter-clockwise into a low-pressure area with a "left-hand screw." They spill out of a high-pressure area in reverse motion. It goes back to Buys Ballot's law of physics that when you "stand with your back to the wind, the low-pressure area is on your left."

At the high altitudes we cruise these pressurized DC-6's and *Constellations*, 17,000 to 23,000 feet, the air movement differs from the surface winds. In place of the circular (closed) low- and high-pressure areas found on the surface, we normally find prevailing westerly winds sweeping across the North

PILOT-AUTHOR H. A. Gurney is shown here in the front office of one of United Air Lines' big DC-6's

UNITED MAINLINER, with Capt. H. A. Gurney at the controls, slides in for a landing at Los Angeles

American continent. When low-pressure cells reach up to our cruising levels, the prevailing westerlies curve to the left (south) and accelerate in velocity in curving until they again take up an eastward heading.

When an occasional towering low-pressure area closes its circulation aloft, the winds then behave as they would at the 2,000-foot level.

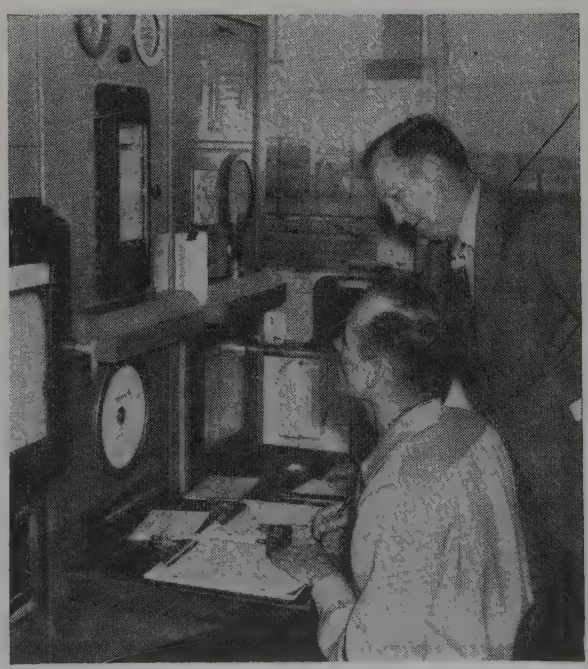
We are using the same old theories in the air today that the Clipper sailing boat Captains used over a century ago. Their ocean crossings followed one track westward and another on the return trip. While best results are obtained on very long flights, lightplane pilots with a fuel range approaching a thousand miles can very well profit from pressure-pattern planning since the slower the airplane, the greater the pay-off in increased groundspeed.

When I plan my regular Los Angeles to Chicago flight, I spend at least 45 minutes checking the weather maps before I figure out my route. My main interest is in the 500 millibar (18,000-foot) upper air chart of wind direction and velocity. That map will show the whole trend of what's cooking at higher altitudes. Storms that develop at these altitudes can be several times as powerful as those at sea level because there are no mountains, or surface friction, to interfere with their development. The surface weather map is useful only for take-off and landing information on a flight of this type.

On a typical flight one night I gave our passengers a completely smooth flight all the way to Chicago while other planes on the regular routes were making unscheduled landings because of rough weather. A cool air mass was moving high aloft over eastern Colorado to the Missouri River. It over-ran a mass of warm moist air coming up from the Gulf of Mexico and produced a string of nocturnal thunderstorms that stretched from Wichita, Kansas, to the Dakotas. Turbulence was relatively weak during daylight hours, but when the sun went down Green Airway 3 was a mighty rough piece of sky.

Before that flight that night, I talked with our dispatcher, Ed Delaney, who has been with United for 19 years.

"Nebraska looks a little (*Continued on page 44*)



AIRPORT weather boss A. K. Showalter talks over the indicated weather conditions with George Fowler *(seated)*

ARMY spotter, flying an L-17 *Navion*, comes in for landing on an airstrip in Korea. These "flying jeeps" are used to pin-point targets for faster fighters like the F-51 *Mustang*

Combat Chasers

By GEO. CHARLES

NIGHT was falling. Shadows were tinting the bloodshot Korean sky, changing it from sunset red to deep purple. The color sank like a vapor blanket and engulfed the shell-pocked hills and oozing rice paddies below.

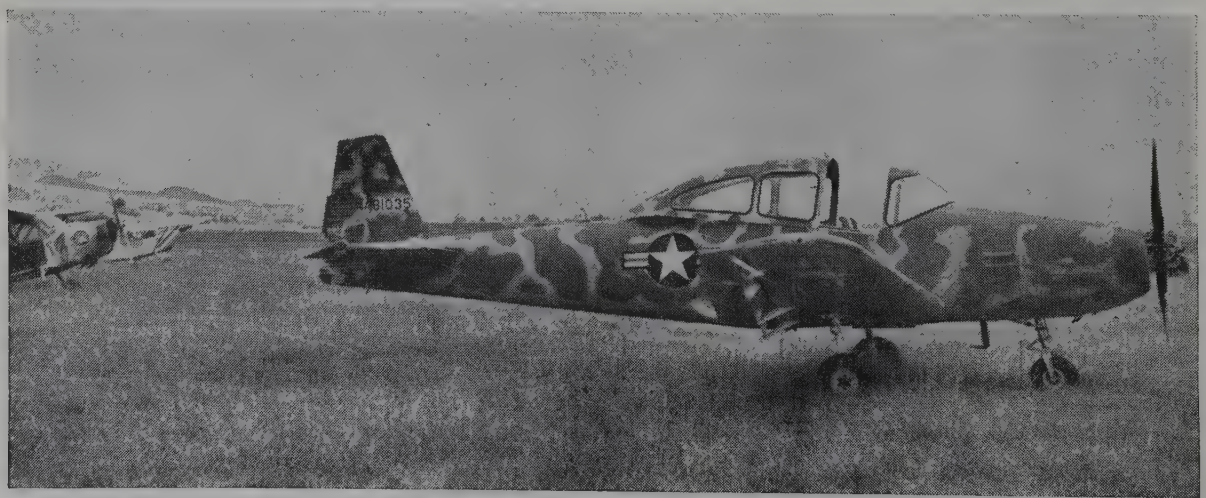
The Army pilot in the L-17 *Navion*, drawing low-altitude circles in the gathering dusk just north of Taejon, stiffened suddenly in his seat. He fixed his eyes on the faint outline of a portion of road twisting palely against the darker background of the war-shattered terrain.

Something moved there—something ominous and steady in its gait. Whatever it was, it was headed straight toward the First Cavalry Division fighting front a few miles to the south.

The pilot banked his little unarmed half-pint airplane and took another look. His eyes were becoming more accustomed to the gloom by now, and the movement below began to take shape. Two T-34 heavy tanks were clanking along, leading a long column of Red China "volunteers" into battle. Unless they were stopped—and quickly—some of the First Cavalry Division boys wouldn't be writing home anymore.

The Army pilot snapped the switch of his VHF transmitter and pulled the microphone close to his

RYAN NAVION, wearing its war paint, is a workhorse of the infantry. Its pilot, like other liaison and observation plane pilots, is called an "aviator," and he's a member of the "walking army." There are 200 of them



lips. Far to the south, five cruising AF F-51 pilots bent an ear to his words. A few minutes later they were above him, winging high and fast in the dim-lit sky. They seemed to hesitate for a moment, uncertainly, then an Air Force pilot's voice came down to the Army pilot's ears.

"Calling Picklebarrel One. Calling Picklebarrel One. Cannot—repeat—*cannot* see target. Over."

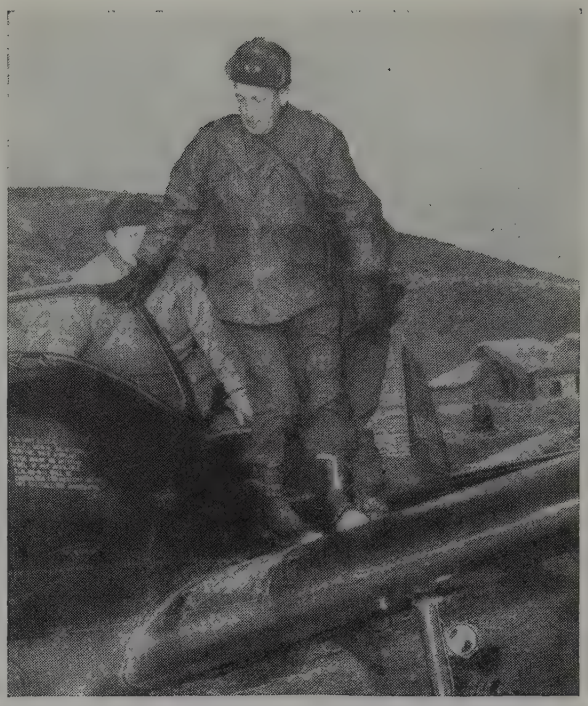
"Okay," replied Army Picklebarrel. "Follow me."

He nosed down then, drifting like a shadow toward the column of enemy troop. High above, the F-51's nosed over into a screaming power dive. The Army pilot dropped his flaps, switched on the little *Navion's* landing lights, and centered the two T-34's in their beams. He held them there.

The Reds grew suddenly frantic. They poured a deadly matrix of rifle and machine-gun fire at the pair of owl eyes that were directing the way for the diving *Mustangs*. It was wasted ammunition. The lights held unwaveringly until the F-51's flashed in and made the kill. Another enemy night attack was effectively "chilled off."

This is only one true incident, selected at random from hundreds, that describes the effective use of light airplanes in the current Korean trouble. These are not Air Force airplanes; they're Army airplanes, and flown by members of the walking army. You might call them "hold overs" from the big split that gave the Air Force complete autonomy as a unit . . . a retention by the Army of a facet of air power so vital to ground-troop operations that integration on a "cooperative" basis is impossible.

The Army pilots, about 200 of them, are all volunteers. Each is an officer, and all are trained to accomplish a wide, weird, and sometimes extremely dangerous variety of missions, all in direct support of ground-troop operations. The Army pilots must meet Air Force physical standards, but beyond that any resemblance to the Air Force, or to the lines of duty followed by AF pilots, is purely coincidental. These little lightplanes are strictly infantry air power—so much so in fact that they are formally designated as "aerial vehicles," and the pilots are called "aviators."



EIGHTH ARMY'S Maj. Gen. B. E. Moore climbs out of a *Navion* that delivered him to hq. Plane landed on Korean road

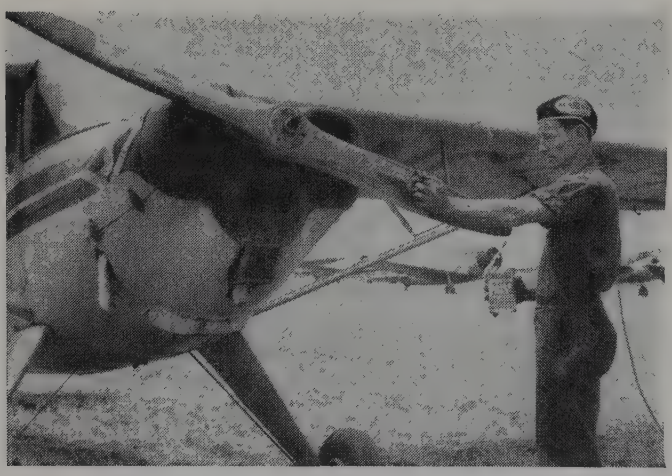
The pilots speak of themselves as being "in the Army aviation business." This description seems to be the only one broad enough to cover their entire field of activity. These "business men" are parceled out in small groups to various Army ground forces where they are instantly available when needed. The airplanes they fly—L-4's, L-5's, L-16's, L-17's, and helicopters—are listed as observation-reconnaissance craft, but in actuality are regarded by the Army as "flying jeeps." When a bit more speed than a jeep possesses is needed, and when the safety of altitude is important, the lightplane fills the bill.

Uses to which the lightplanes have been put substantiate the fact that they are regarded more as "flying jeeps" than as airplanes. Who, for instance, would consider rounding up a group of prisoners from the air? Yet this has happened several times with a light-

(*Continued on page 42*)

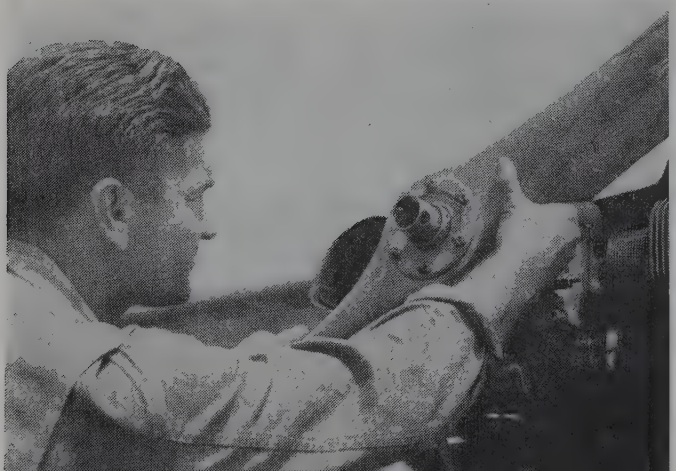
NAVION with Capt. Wm. Capps at controls took off from *USS Badoeng Straits* to pick up Gen. Almond at Inchon. Capt. Capps got off the carrier deck in 300 feet

PROPELLER TIP that is definitely in need of maintenance attention is shown in this photo. Note the dents in the metal, frayed fabric and poor condition of the finish. Prop like this could set up vibration, do lot of damage



COAT of good grade of glass or auto wax on a propeller will help preserve finish, improve its performance

PROP INSPECTION calls for careful checking of bolts and cotter keys on the hub. Check prop, too, for any wobble



Props Are Not

Props are not being discarded yet . . . .

so be sure you take good care of yours

By GILBERT C. CLOSE

PROPELLERS may or may not be a necessary evil. Jet propulsion may eventually relegate them to museum shelves. But regardless of their current social status and despite their ultimate destiny, right now the propeller on the average lightplane is not expendable. It's going to be quite a while before pilots have to visit a historical exhibit to see what one looks like. Meanwhile, each pilot will be wise to get better acquainted with his own prop. It's going to have to chew him through quite a few million miles of air before lightplane jets become commonly available. Sudden and complete propeller failure during flight is rare. This is very fortunate, for pilots who have lived through both comparative experiences claim that a lost prop blade and a direct hit by an ack-ack shell produce results that

have much in common. One instant everything may be calm and serene. The next, after a blade or a part of it goes, tons of centrifugal force, balanced out in the undamaged prop, become a demon of destruction, wrenching and tearing at motor-mount and engine, smashing the crankcase, twisting thrust bearings, sending vibrations through the airframe that threaten every joint and seam.

It all happens too quickly for effective countermeasures. The pilot has no time to throttle down or reach for the switch. Those who have experienced such an accident say that you don't do anything for a few seconds. You're completely stunned by the seeming cataclysm that, in a split second, transforms the cabin into all semblances of a motor-driven cocktail shaker.

You'll probably never lose a prop blade while in flight. But propellers don't have to fail completely to cause a lot of trouble. In fact, they can stir up a lot of consternation when, outwardly, they look to be in tip-top shape. Pilot Herb Brown of Los Angeles will vouch for that.

Due to consistently zero-zero weather Herb hadn't flown his *Cub* for several weeks. When at last the

NICKED PROP can be taken care of. Gently file off nicks before they lead to greater damage. Do the job yourself

Expendable

California sunshine managed to peek through the fog, he lost no time in getting to the airport. Preflight inspection revealed nothing wrong. Herb warmed his motor, taxied onto the runway and shoved full throttle. Then a curious sensation assailed him.

"Like someone was playing tick-tac-toe on the seat of my pants," he admitted later.

Herb's teeth chattered; the cabin windows chattered. The wheel felt like it was anchored to the vibrating element of a Gargantuan massaging machine. As quick as he could collect his scattered wits, Herb throttled down and swerved from the runway. When the motor slowed down, the vibrating stopped. At idle speed, everything ticked as smoothly as the proverbial clock.

The field mechanic, once he had learned of the trouble, didn't have to search long to discover its cause. The wood laminations in one propeller blade had separated very slightly. The prop's varnish coating had ruptured into a slight hairline crack—but a crack wide enough so that moisture could enter.

The mechanic's analysis was laconic. "You're prop blade has stored (*Continued on page 48*)

CHECK prop-blade track via stick driven into ground. Clearance between prop, stick shouldn't vary more than one-eighth inch

DEFENDER PILOT simulates combat maneuvering over trees adjoining Whiteman Airpark. Note Napalm tanks under wings

Pilot Report: FD-25

By DON DOWNIE

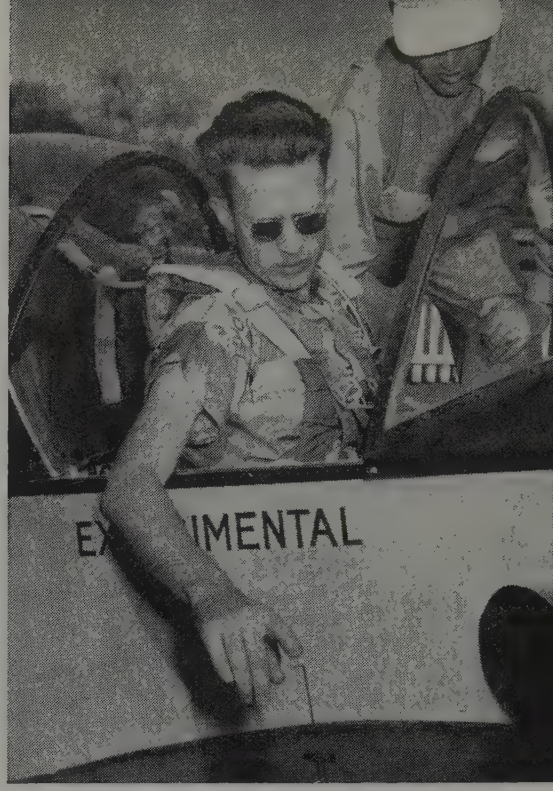
DID YOU ever see a flying rocket launcher? Napalm bombs, general-purpose bombs, rockets and machine guns—all on the same little airplane. No wonder they call it the Fletcher *Defender.*

A relatively low-cost, completely easy-to-fly lightplane with emphasis on quick maintenance, the Fletcher FD-25 *Defender* is the first post World War II aircraft designed as a close-in support weapon, not meant to take the place of any existing piece of fighting equipment, but to add to the strong right arm of the United States.

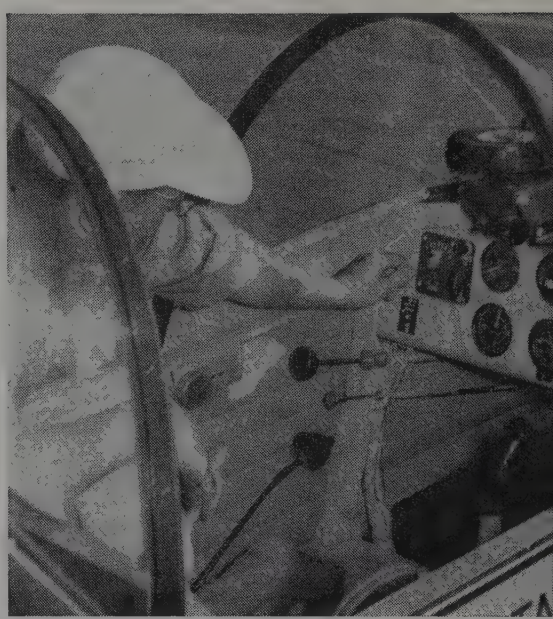
This airplane was originally conceived in the front office of the Fletcher Aviation Corp. in Pasadena, California, in the days immediately following the original Red Korean offensive where the huge Russian-made T-34 tanks first proved so effective. Following the normal nine-month period of development, the prototype FD-25 was first flown. Since that time it has been demonstrated to the Marines, Navy, Ground Forces and Tactical Air Forces. At this writing, the plane is in the middle of the controversy that has existed for the past two or three years in Washington over what—if any—aircraft shall be assigned to commands other than the Air Force.

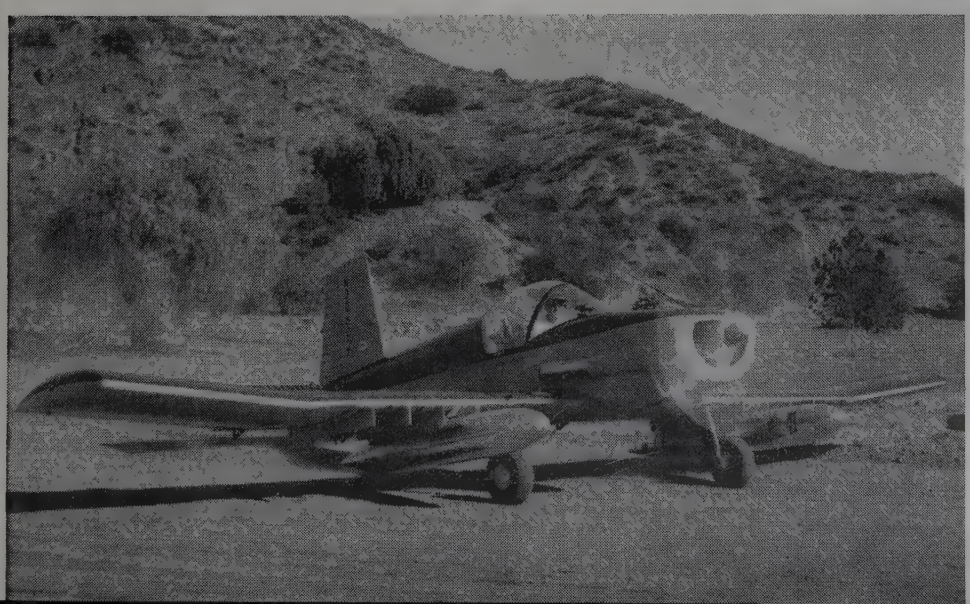
"The FD-25 has been designed specifically to be the least amount of airframe to carry the maximum ordnance to a target. Producible in either magnesium or aluminum alloys, it is inexpensive in initial cost, requires a minimum of pilot training, and can be operated from small undeveloped airstrips as used by liaison aircraft close to the front lines," says Wendell Fletcher, President of the company that now builds the bulk of the jettisonable fuel tanks and Napalm bomb tanks in the air today.

From a pilot's viewpoint, the scrappy (*Continued on page 50*)



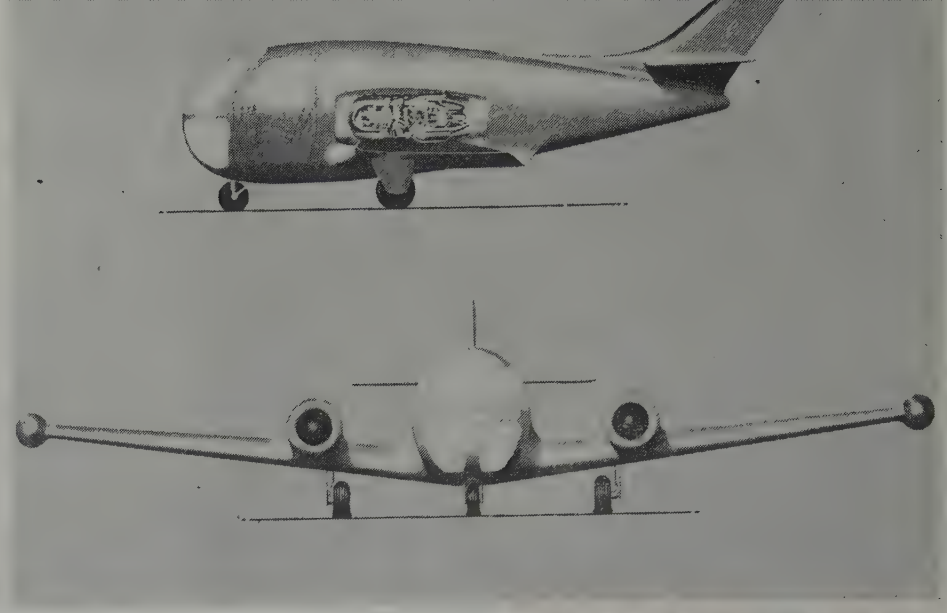
PILOT-AUTHOR checks non-leak gas gage for FD-25 *Defender's* right-wing tank





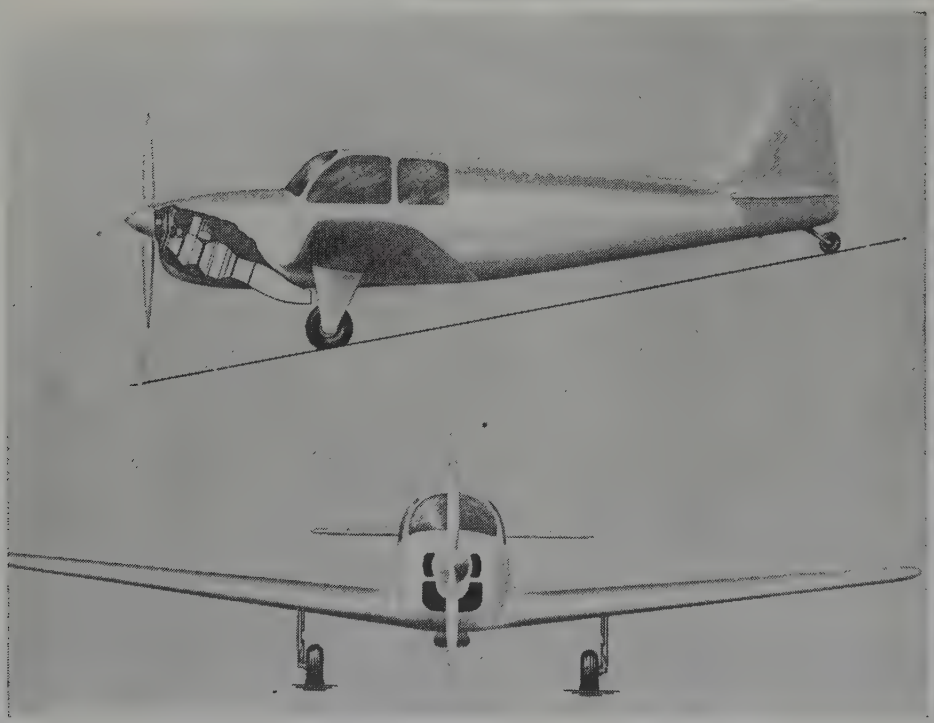
PROJECT ENGINEER on the *Defender,* John Thorp, points out rocket, bomb switch in cockpit *(above).* Note gun sight atop panel, knob-on-a-rod throttle at far left, and gun trigger on the stick

TORQUE calls for plenty of right rudder to keep plane from pulling off runway. Thrust line of Continental E-225 engine is slanted 3° to the right and 5° down, but there's still torque



EXECUTIVE twin-engine aircraft *(right)* powered by ducted fan turbine has reduced frontal area, less drag. Speed of such an aircraft would be in the 200-mph to 400-mph bracket

TURBINE-PROP plane of conventional arrangement *(below)* would offer greater load-carrying capacity over short range. Handicap in this would be the high rate of fuel consumption



Turbines for Small Planes

Turbine opens up new avenue of development in personal-plane design

By C. E. Bachle

Vice Pres., Continental Aviation & Engineering Corp.

SINCE the days of the Wright Brothers, there has been constant effort to try to fly better. Until about 1930, the main problem was to fly with more certainty and safety. Since 1930—and with the first problem in a fair state of solution, the problem has been to fly in a more useful way, *i.e.*, increased load-carrying capacity, greater economy, and greater speed. Steady progress has been made, but today personal-aircraft development appears to have reached a stagnation point—as illustrated in Fig. 1. With the advent of the turbine, however, a new avenue of development seems to have opened up which should break the stalemate and make possible the next major step of progress. This discussion will describe the things that can now be done with the turbine, and venture some predictions based on present achievement in the turbine powerplant field.

Whether or not aircraft designers recognize it, all aircraft have been largely designed around the powerplant. The location of the engine was selected

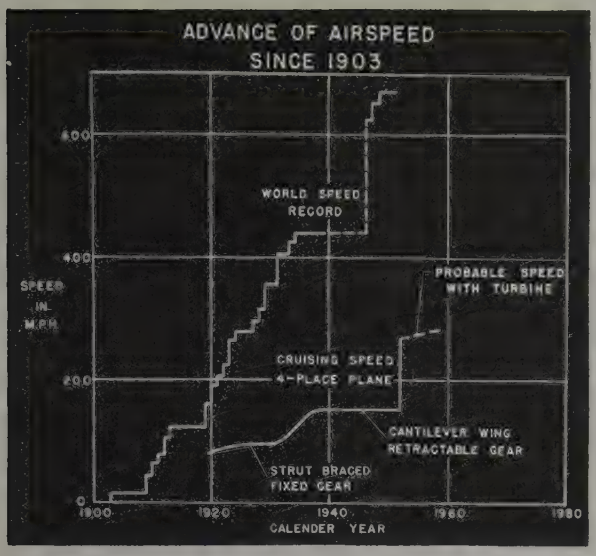


FIG. 1—Note that four-place aircraft have not shown increased speed in recent years. Turbine could cure this

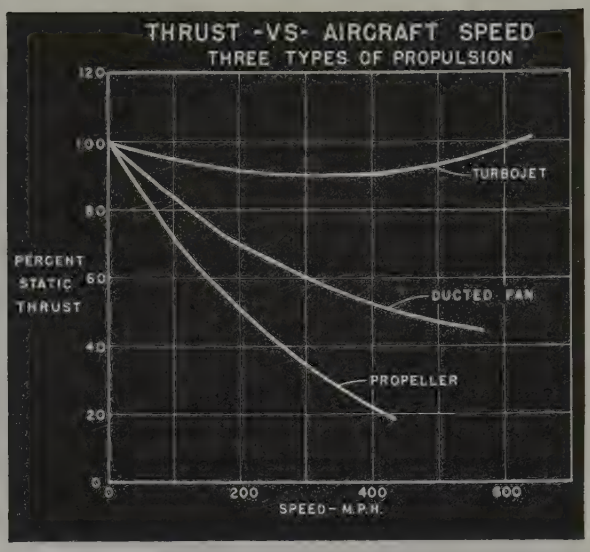


FIG. 2—Chart indicates that jet propulsion gives less reduction in thrust as the aircraft speed is increased

so as to favor engine cooling and to give propellers room to operate. Landing gear arrangements were dictated by propeller clearance requirements. Landing gear often determines wing location, etc. Through the years, the best compromises among a host of conflicting requirements have been found through a costly series of trial-and-error experiments.

Examination of the 1950 four-place aircraft, both military and commercial, shows striking uniformity. Engines are mostly in front of the pilot driving tractor-type propellers, resulting in considerable obstruction of vision and some passenger discomfort because of engine vibration, noise, and heat next to the cabin. The use of turbines will bring a radical departure from the piston-engine tradition and the result will be greatly increased comfort, safety, and speed. The increased speed, in turn, is a safety promoter since weather at a destination is less likely to change if the prediction interval is shorter, and delay because of headwinds is of lesser importance. The objectionable features of present aircraft have become so commonplace that little time is given to consideration of other possibilities. The turbine offers a way to make a fresh start with the next step toward the goal of flying like a bird, only better.

For the aircraft wing to produce lift, forward motion must be produced by some device able to produce thrust. All thrust in aircraft, whether propeller or jet, is the result of the same basic law of nature, "where there is action, there is reaction." The propeller is used to increase the velocity of a quantity of air. This increase in airspeed across the propeller creates a force which is the *action*, while the pull imparted to the aircraft is the *reaction*. The jet machine utilizes the same principle. The jet engine and the propeller-piston engine differ only in the pounds of air (*Continued on page 45*)

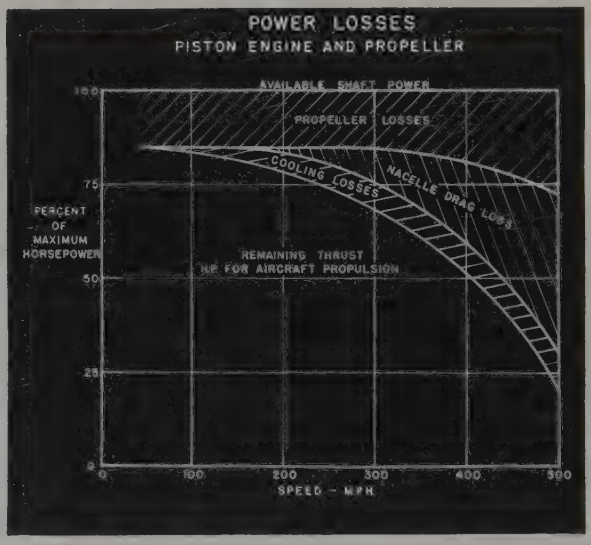


FIG. 3—As shown in this chart, note how propeller loss and nacelle loss become important as speed increases

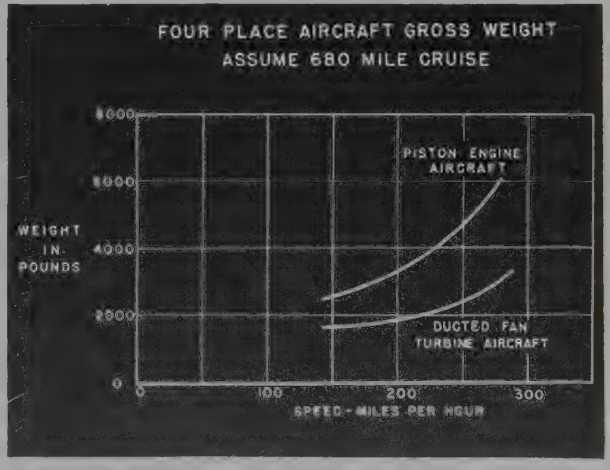
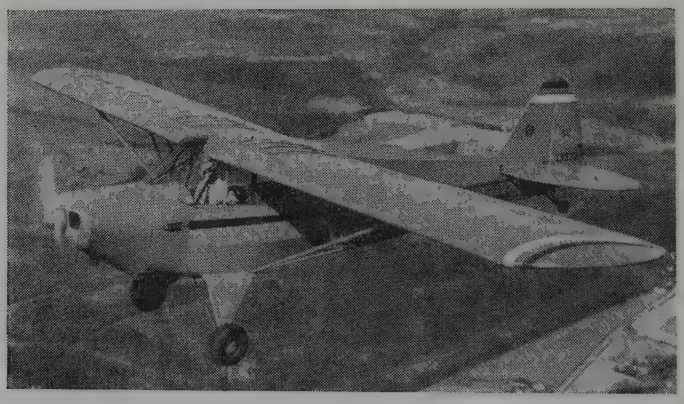

FOUR PLACE AIRCRAFT GROSS WEIGHT
ASSUME 680 MILE CRUISE
PISTON ENGINE AIRCRAFT
DUCTED FAN TURBINE AIRCRAFT
WEIGHT IN POUNDS
SPEED - MILES PER HOUR

FIG. 4—Due to increasing losses with piston engine installation, plane gross weight rises sharply above 200 mph

SECTIONAL U-9 shows course laid out between Teterboro, N. J. and Phillipsburg, Pa. Course between Teterboro and Allentown, Pa., first leg of X-C, is marked off with a pip every 10 miles. These check points enable pilot to

Fly the Map

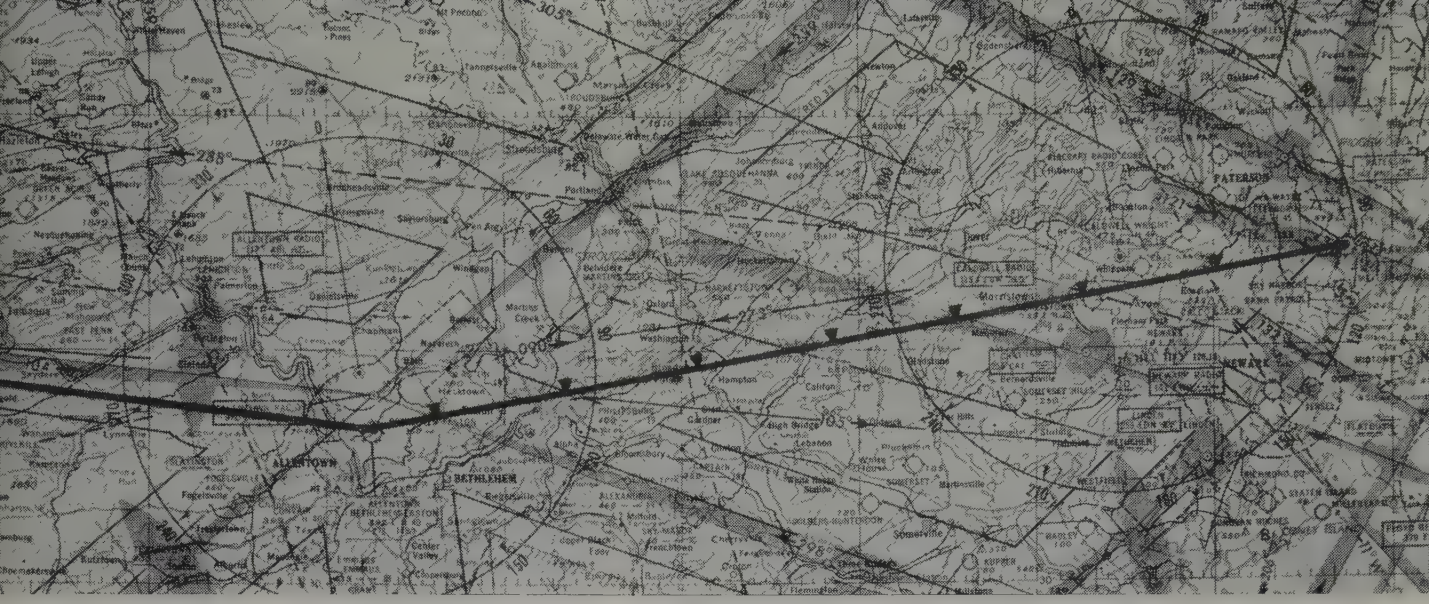


X-C PILOT should practice check-point flying, learn relationship between sectional map and the ground over which he's flying

Radio is top aid to navigation, but know how to fly the map in case radio is out

Not long ago a national magazine ran another one of these airplane stories where the old airline pilot who flew so loyally for many years is now about to be let out because he can't hit 20-20 on the sight test and do 40 push-ups without collapsing. The story runs its usual course—a smart-aleck young pilot, a luscious blonde stewardess and, of course, poor old Hopeless Homer who can't be trusted with anything heavier than a 40-horse *Cub*. We meet the cast in a large transport plane lost in the clouds. The radio is out. The fuel is low. Everybody is frantic, particularly the young smart aleck who can't pilot a lick without the help of the automatic devices the cockpit is jammed with.

Hopeless Homer speaks up at the last instant, when it appears that passengers and crew are about to be dashed to pieces. "Allow me," he says, "to take it down under the overcast. I used to fly this section back in '08, and I know every bush from Chicago to Mobile."



estimate drift, make corrected heading. Course line from Allentown to Phillipsburg runs along Airway Green #3. Route is over rugged hills, quarries; no forced landing areas. Best air route would be south *(not shown)* of #3

There being no other choice, Homer gets the yoke, lets down through the soup, picks up a branch of the Chicago and Mobile, and totes everybody safely home, merely by following the railroad tracks.

This was a real cornball of a story, but it had a good point. Automatic navigation devices *do* fail, even though they don't very often. Radio beams *do* get split up by mountains, curve weirdly or just suddenly go off the air, and if you are not prepared to haul out a sectional map and start flying by pilotage, you had better start looking for a nice smooth pasture.

This piece concerns flying the map. It is written for two types of pilot. First, the guy who can't afford automatic navigation devices or possibly even a good radio. Second, the guy whose plane is fully equipped with the best of everything, but who someday may find himself in the same fix as Hopeless Homer and his friends.

If you happen to belong to the first group, as most of us do, pick a really top-notch day for your first really long cross-country. Pick a day when the sky is clear blue and you can see 50 miles in all directions. These days don't happen very often, but it will pay you to wait for one because (1) you probably won't get lost, even if you do louse up the detail pretty completely, and (2) you'll get a swell picture relationship between the sectional map on your lap and the landscape you are flying over. Finally, it's easier to "keep the compass honest," which I will explain.

Haul out a sectional map and lay off your course, between, say, Teterboro, New Jersey, and Phillipsburg, Pennsylvania. This area or one similar to it is a good test hop for you because it takes you first over heavily populated areas confused by sprawling, interlocking towns, a bewildering maze of railroads and highways, and finally over long stretches of lonely mountain ridges. I'm not talking now about the standard 50-mile triangular cross-country trip you took to get your private. I'm talking of a fairly long, rugged trip.

The first tip I've got on making a long cross-country is to follow an airway, even if it seems to take you considerably off your course. Actually you don't lose more than a few miles by doglegging around on the CAA-controlled pathways, and you are infinitely safer by so doing. You have better fields, lights at night, weather information when you land, and if you have a forced landing and had the good sense to file a flight plan, the search planes are apt to pick you up in a matter of hours instead of days. A good friend of mine who travels widely by Piper *Pacer*, servicing a national sales account, tipped me off to the idea of traveling airways 100 per cent. The peace of mind you gain far outweighs the few minutes you lose, he says. He ought to know. He's put in 800 hours of it.

Now then, when you look at the New York sectional map, you find that there is a swell civil airway—Green 3—that goes straight across from Allentown to Phillipsburg, about 200 miles. But as you examine the map along that straight airway, the map doesn't look so pleasant. It's one long mass of twisty brown contour lines pockmarked with the sign of the crossed picks. That means you'll be flying over rugged hills with many quarries, a very sad place indeed to have a forced landing.

So let's look further. Suppose you cut through the nice flat Dutch country to the southward, between Allentown and Lancaster, and (*Continued on page 52*)

By FRANK L. HARVEY

FRONT OFFICE dwellers aboard General Eisenhower's *Constellation* are Major Draper *(left)*, and Major Harkness

NAVIGATOR is linguist Major Puglisi who doubles on the mike for tower talk in five languages

Gen. "Ike's" Eagle

SHAPE Commander's plane is the "Columbine" . . . his pilot is Maj. Wm. Draper

By M/Sgt. DON WEBER

A sleek, shiny "Connie" glides out of the sky onto Orly Field in Paris, and taxies to the parking ramp in front of Operations. The door opens as attendants push the unloading ramp into place. General of the Army Dwight D. Eisenhower, SHAPE commander, steps down from the plane and greets those there to meet him. Then, invariably, the general turns to the Air Force officer who has followed him out of the plane and says: "Thanks, Bill. Thanks for a nice trip."

Other dignitaries—Senators, Congressmen, Ministers, Ambassadors, Generals, Admirals, in fact the whole gamut of VIP's who have at one time or another been General "Ike's" guests aboard the "Columbine"—have been quick to add their thanks and express their appreciation in words such as these: "It was a wonderful ride,

GENERAL EISENHOWER talks over next flight with his plane's commander, Major William G. Draper

Bill. Hope to fly with you again soon."

The "Bill" on the receiving end of all these expressions of gratitude is Major William G. Draper, age 30, of Silver Springs, Maryland, and Washington, D. C. Pleasant, soft spoken and of medium build, he is the commander of the "Columbine" which is fast becoming the best-known aircraft in Europe, if not the Free World.

Early this year when SHAPE was in the making, Lieutenant General Lauris Norstad, now Commander-in-Chief of Allied Air Forces, Central Europe and of the U. S. Air Forces in Europe, was asked to select a pilot to fly General Eisenhower on his now famous 13-country, 20,000-mile tour of the NATO countries. His thoughts turned naturally to the Special Air Missions (SAM) squadron in Washington whose business is flying VIP's in and out of the Nation's capital. Just as naturally his choice was the man who has been the chief pilot of that outfit for several years.

"It didn't take me long to accept the assignment," Major Draper admits. "Especially after I was told that I could have my pick of the flying talent of the Air Force for my crew." (*Continued on page 52*)

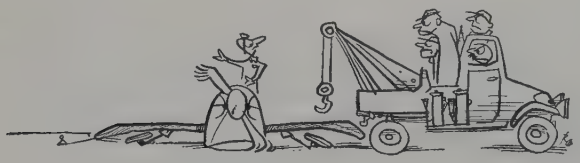
RADIO OPERATOR aboard the "Columbine" is T/Sgt. Daren A. Linnel. Home to T/Sgt. Linnel is Duluth, Minnesota

CREW of plane includes *(standing, left to right)* Sgt. Snider, Sgt. McClane, Sgt. Higgins, Sgt. Woodward and Sgt. Linnel; *(kneeling, left to right)* Maj. Draper, Maj. Harkness, Maj. Puglisi and Capt. Keith L. Christensen

DILBERT

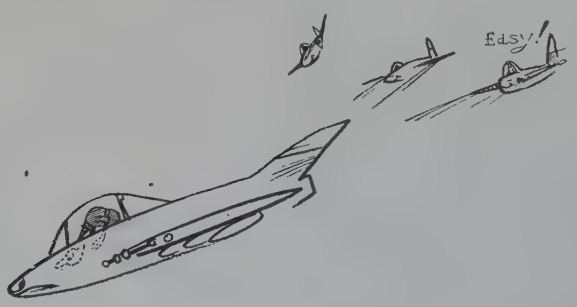
By Seth Warner and Robert C. Osborn

High Price of Ignorance—During his landing run, Dilbert reached down to raise his flaps. Imagine his surprise, chagrin and embarrassment when his landing gear retracted instead, and he ground to a sickening stop. The crash crew didn't have to imagine anything; they saw it happen. Also the foolish look on Dilbert's face as he gave them the old alibi when they drove up.



This mental blackout only resulted in a costly overhaul, but who knows what will happen during the next blackout?

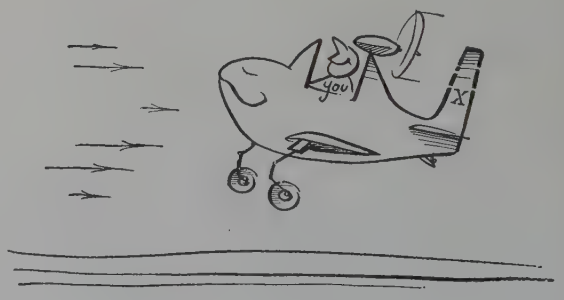
As has often been said before, "You *have* to know your cockpit!" You can't possibly make a visual check every time you pull, push, or twist some gadget down in there. You must know their exact location and "feel," so you can put your hand on any one of them and operate it correctly without having to poke your head in the cockpit to see what you are doing. That's why all the screaming about "cockpit drill."



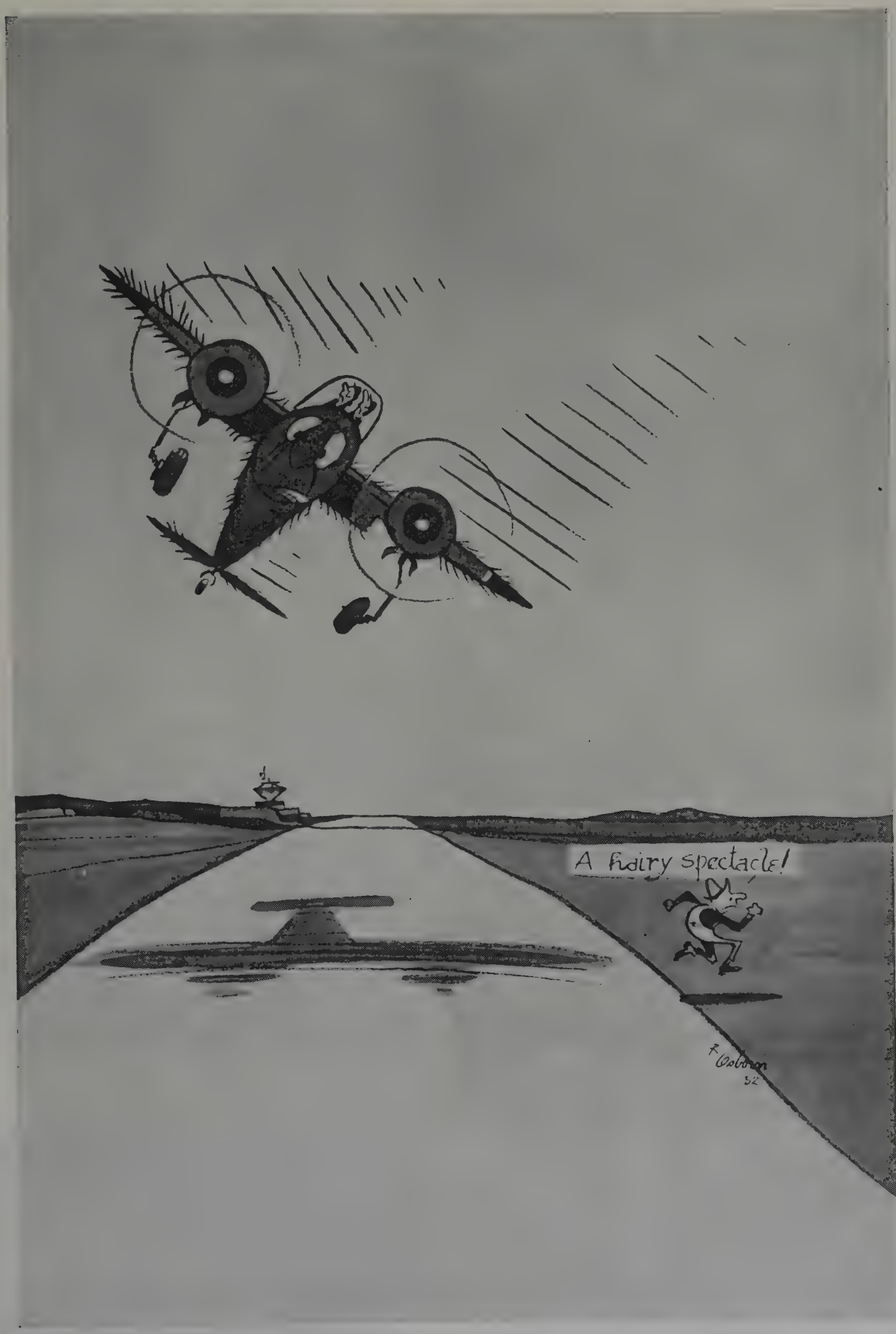
You may be a combat pilot some day. Here's how one Ace summed it up for them, "A pilot is no damn good in combat as long as he has to think about handling his plane."

Will She Stall—Here is a problem, recently received in the mail, which some of you theory-of-flight experts may enjoy wrestling with.

"A plane is coming in for a landing. It is 50 feet in the air and traveling at an indicated airspeed of 80 mph. The plane stalls at an indicated airspeed of 70 mph. There is a 40 mph headwind. Suddenly, the 40-mile wind stops—completely. What will happen to the plane?"



1. Will it stall?
2. Will it continue its approach in a normal manner?
3. Will it lose 40 mph airspeed the moment the wind stops?
4. Will the airspeed indicator register 40 mph lower the instant the (*Continued on page 56*)



"Go 'round again? Never! I'll see you in h . . . first." P.S. He will . . . but we won't be there.

Exec-Plane Schedules

Corporate-plane management makes certain the company plane is all set to go when business wants it

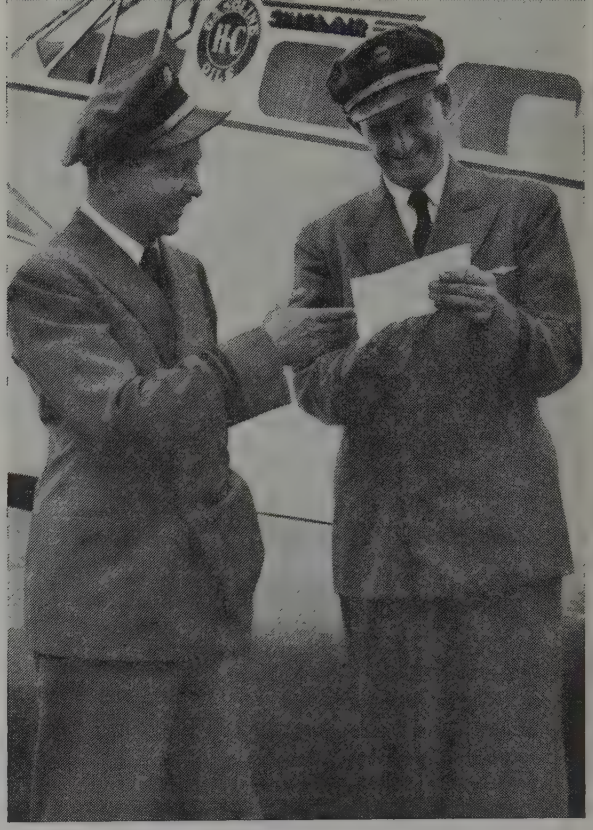
By E. GARDNER

When today's business executive steps aboard his DC-3 or *Lodestar* and heads for a meeting halfway across the continent, his flight represents careful coordination and planning on the part of many people. The company plane doesn't just *happen* to be available when the boss needs it. A whole chain of integrated actions has assured the availability of the plane and the success of the flight.

There are many facets to the mechanics of scheduling executive-plane operation. For example, maintenance of the executive aircraft must be planned so that the plane is not in the throes of a hundred-hour check when the chairman of the board wants to make a trip. Wash jobs and paint touch-ups are timed to coincide with other repairs or inspections. Some companies even schedule their plane and engine checks many flying hours ahead of time so as to reduce even remote possibilities of having to be hangared for minor repairs or adjustments. And then, of course, there is the plane's crew—it must be notified of the flight enough in advance to assure final preparations.

But the growing factor in scheduling the movements of any airplane is the purpose for which it was purchased. Your reporter found the term "executive aircraft" most apt: a business organization buys a plane or planes primarily to enable its top executives to better cover their business areas—in essence, to do a better job.

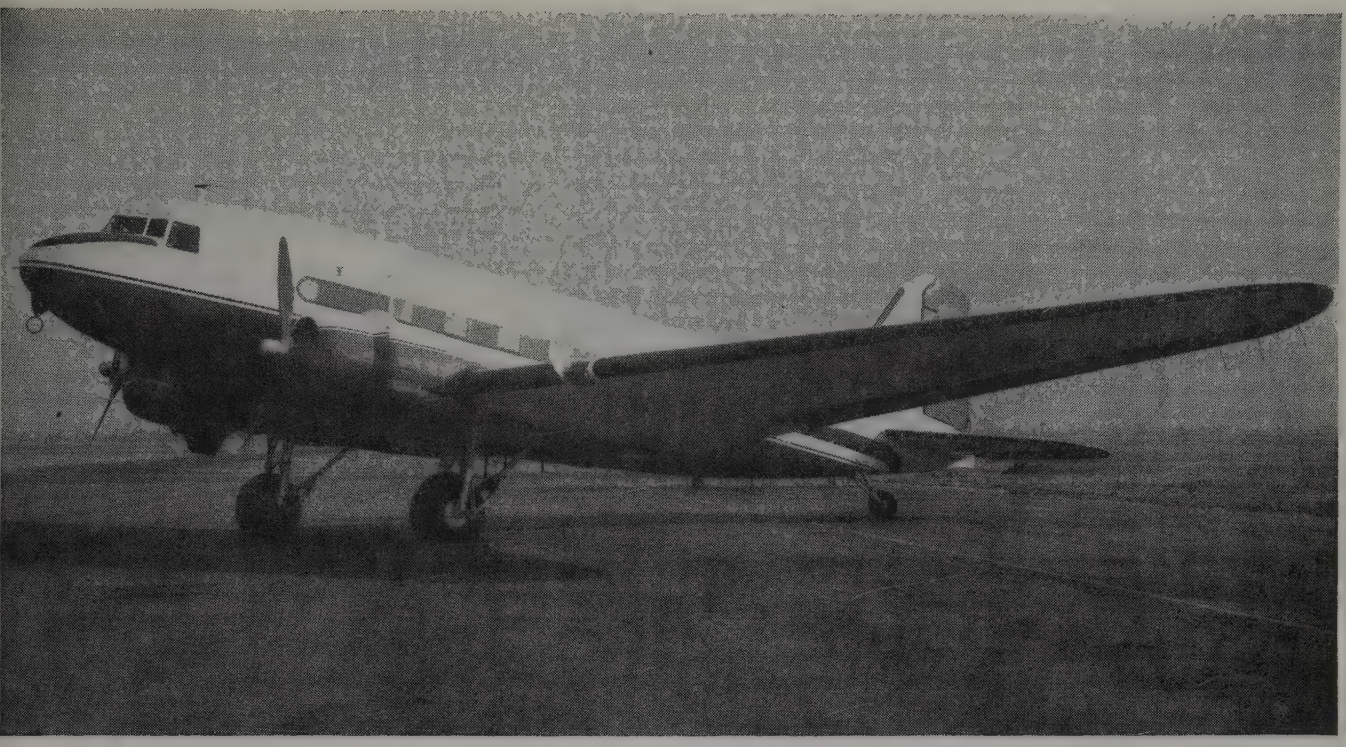
Perhaps Col. E. W. (*Continued on page 54*)



SINCLAIR OIL pilots L. T. Houck *(left)* and J. Muncil average 50 hours per month flying executives

ESSO operates four planes. The DC-3 *(below)* was in the air for company business 830 hours in 1950

EXECUTIVE DC-3 belonging to Kudner Agency, Inc., New York, is equipped with VOR, ILS, ADF, A-12



KUDNER PLANE is scheduled by agency's traffic manager, a former airline man familiar with problems of scheduling. The company's volume of travel is more than enough to keep the luxuriously appointed Kudner DC-3 busy

FLIGHT RECORD for National Dairy Products DC-3 shows point of departure, destination, departure and arrival time, hours flown and the passengers aboard. In addition, all landing fees and gas purchases are recorded

NATIONAL DAIRY PRODUCTS CO., INC FLIGHT REPORT N 69040

	DATE	FLIGHT TRIP (SEPARATE LINE FOR EACH LANDING) From	To	TIME Depart	Arrive	PLANE MILES	HOURS	TYPE OF FLYING Day	Night	Instrument	REMARKS
1	10/7/51	Albany	Westchester Apt	8:35	9:25	120	:50	✓			
2	"	Westchester Apt	Wash. D.C.	9:40	11:35	251	1:55				
3	"	Wash. DC	Knoxville	12:10	15:20	440	3:10				
4	"	Knoxville	Chattanooga	17:05	17:35	86	:30		✓	✓	
5	"	Chattanooga	New Orleans	18:50	21:25	483	2:35		✓	✓	
					TOTALS	1380	9:00				

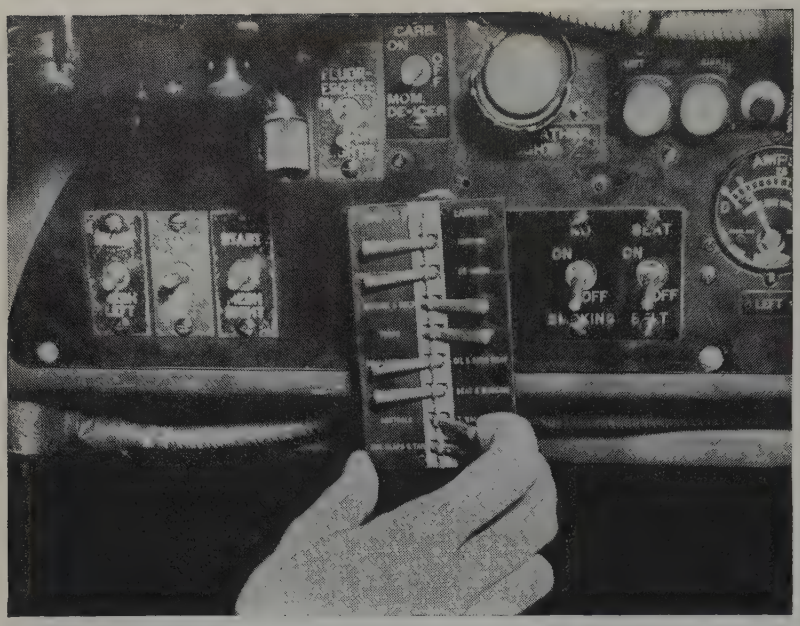
	PASSENGERS	FROM	TO	PASSENGER MILES
1	A.J. Keller	Albany	N Orleans	1380
2	T.M. Gardner	Westchester	"	1260
3	G.H. Fordham	Wash. DC	"	1009
4	L.A. Purdy	"	"	1009
5				
6				4658
7				
8				
9				
10				
11				
12				
13				
14				

REMARKS ENGINES AND AIRPLANE

LANDING FEES & PURCHASES (*FOR CASH)

DATE	ITEM	QUANTITY	COST	VENDOR & LOCATION
10-7-51	Gasoline	297	67.71	Shell - Wash DC
10-7-51	"	350	139.72	Esso Knoxville, Tenn.

SIGNED J.P. Hollenbeck CO-PILOT
E.R. Strong PILOT



Flying Pharmacists

By ELIOT TOZER

TAKE-OFF and landing check list *(left)* was devised by Squibb pilots, John Rintoul and Mike Miller. It's mounted above co-pilot

E. R. Squibb & Sons' executive DC-3 plays a leading role in selling and public relations

IT WAS only a grass strip, but it was 3500 feet long, and John Rintoul had put his DC-3 down on far less. So he eased back on the yoke and let her slide in. He braked down, turned, and taxied back slowly—the chairman of the board and the president of his company were both in the cabin. Before he could cut his throttle, half the kids of Waukegan had rushed to the airport fence to watch.

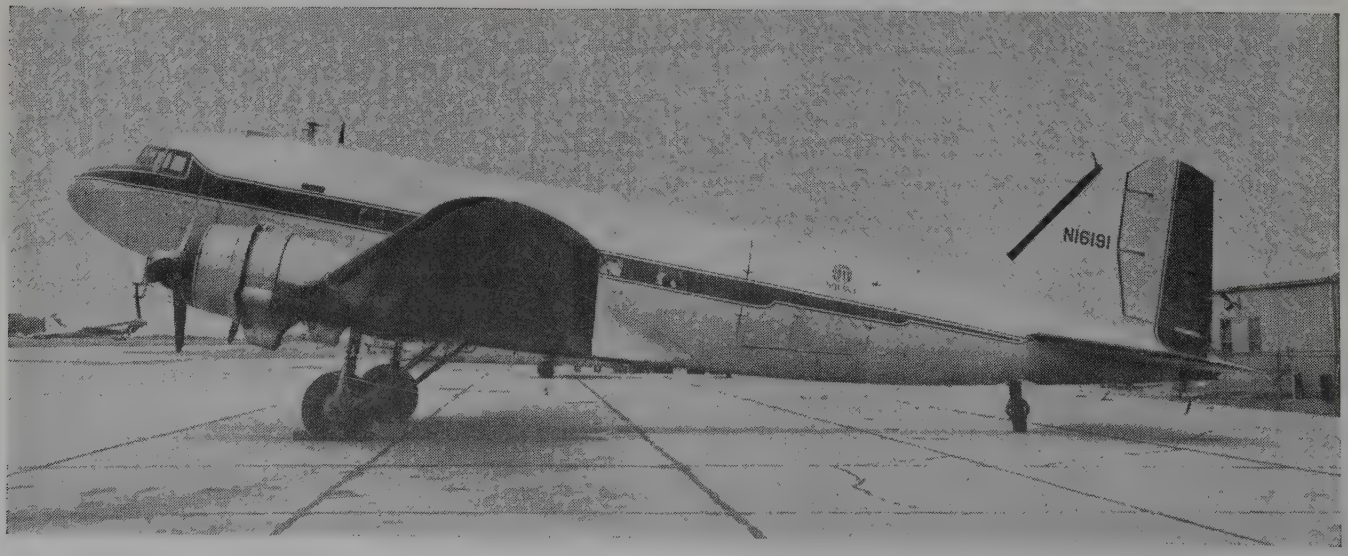
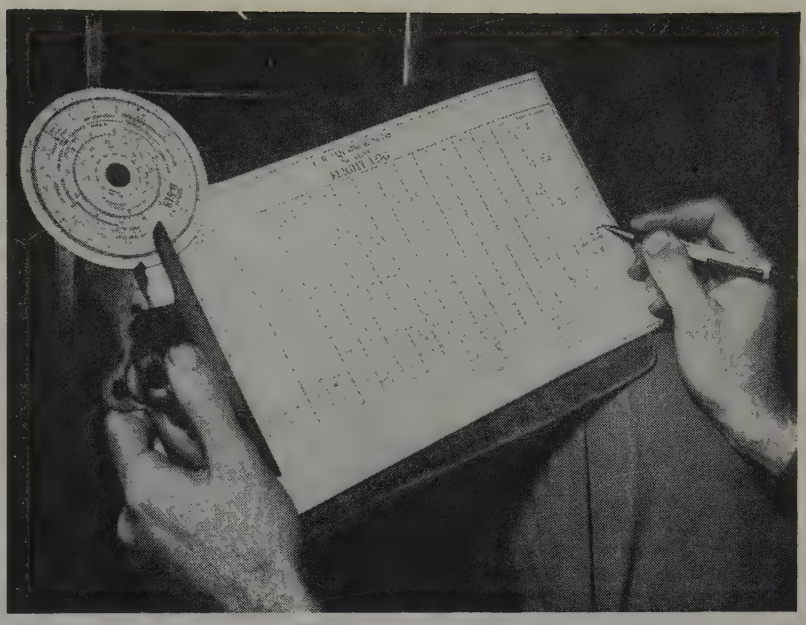
The kids' next move was to climb the fence to get a closer look at the shiny Douglas. But that didn't bother John Rintoul and his co-pilot, Mike Miller. Knowing their brown-trimmed DC-3 helps sell their company—E. R. Squibb & Sons—products, they invited the kids to file through the converted cabin up to the cockpit to gape at the thousand-eyed instrument panel.

John Rintoul and Mike Miller, along with mechanic Al Nelson are out to sell Squibb with their plane. And in the five and one half years that they've flown together and pushed the same DC-3 around for their company they've done pretty well.

The Squibb plane has put in so many hours now that the nation's towers recognize its number.

For example, Rintoul has but to switch on his Collins transmitter and say, "Cleveland Tower, this is Douglas 16191. I'm 10 miles north of . . ."

E. R. SQUIBB company plane is a DC-3. Executive interior can be removed in 20 minutes, plane used for cargo hauling



PILOTS maintain a very complete flight log which records "To," "From," "Distance," "ETA," "Actual Time Over," etc.

"Squibbola!" comes a glad cry from the tower. Then, "We've been waiting for you. Our smiles are getting dingy. We've lost that 'fresh' look . . . the look a tower operator needs so badly."

And Rintoul and Miller know it's time for their annual pilgrimage to the heights with dental cream and tooth brushes for every single man in the tower. The same goes every year for LaGuardia, St. Louis, Glendale and all the rest.

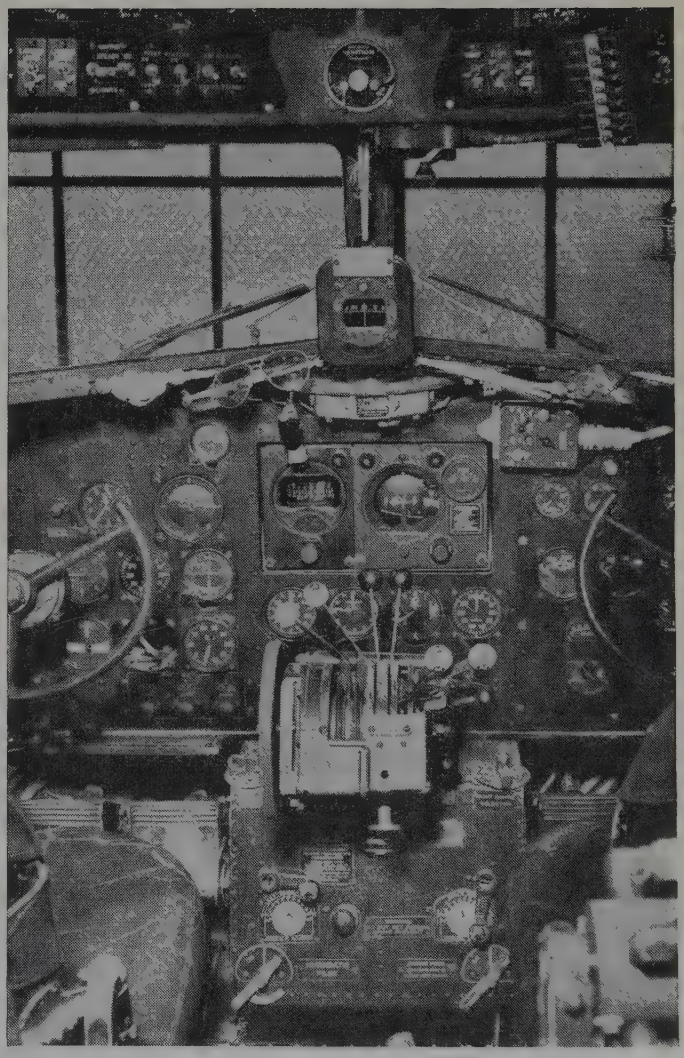
As for selling Squibb, that's precisely what President Lowell P. Weicker had in mind when he brought the DC-3 back in April, 1946. To Weicker, the old "workhorse of World War II" was just what his company needed to merchandise its Streptomycin, Navitol, and Procaine, its ether and peppermint oil and dental cream. To Weicker, the DC-3 was just the plane to haul such medicines to those unpredictable "pressure points" in the drug industry where "runs" on certain drugs sometimes occur.

Weicker set up a program for his plane—a program that keeps the DC-3 in the air 60 to 65 hours per month. That is, 65 hours per month except when he and a half dozen other executives pile in for what the company calls the Dawn Patrol.

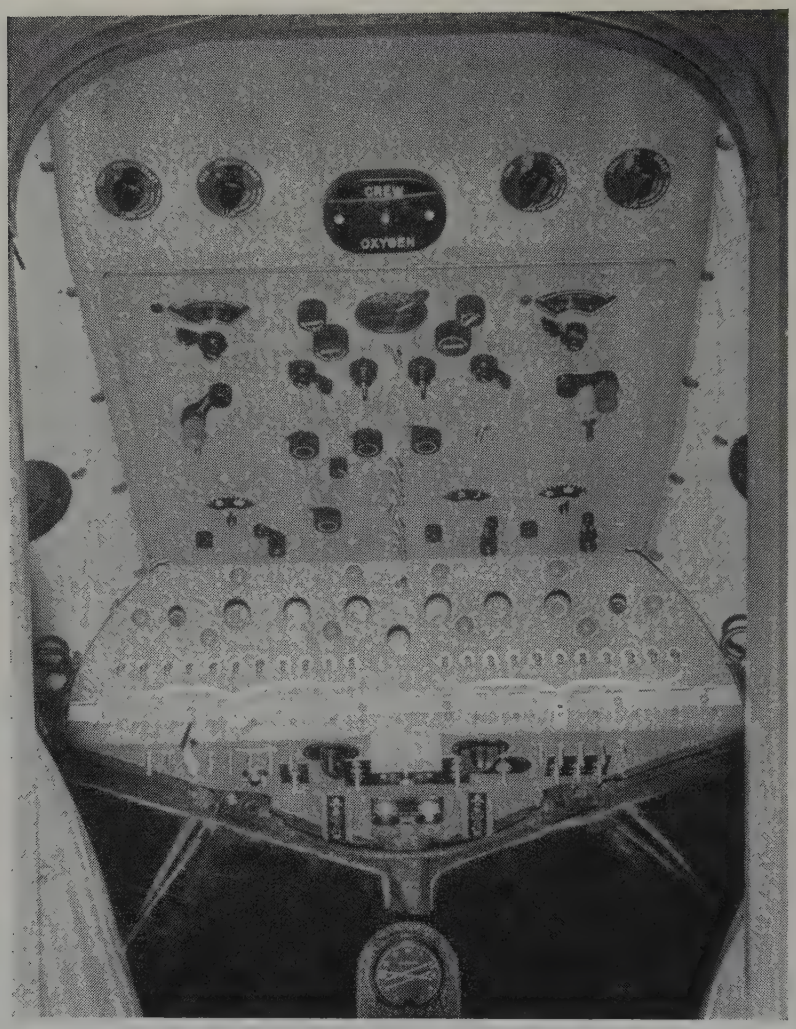
"That's *Dawn* with a capital *D* and *Patrol* with a capital *P*," says Public Relations Officer Caleb Coffin who's been on a couple. Coffin groans the words "Dawn Patrol" with good reason. The trip lasts six to eight weeks. And the plane is in the air almost constantly, bringing groups of salesmen to five different district sales meetings that are held once a year.

"It works like this," says Coffin. "Suppose we have one of the annual district meetings scheduled in Chicago. Mr. Weicker and his assistants fly in at noon. Rintoul drops them and takes off right away for Madison, Wisconsin, where he picks up salesmen who've gathered there from several nearby cities. Back to Chicago with the salesmen, then off again to Cleveland where he picks up more salesmen who've driven and railroaded in from surrounding towns. Then, maybe there's one more hop, or two. While the meeting's going on, the plane stands by. Then Rintoul flies 'em all back to where they came from."

A rugged schedule for any pilot, but John Rintoul takes it in stride. He's been around airplanes for a long time. He got his pilot's license at Roosevelt Field in 1929. And at one time or another, he's owned and operated a (*Continued on page 56*)



INSTRUMENT PANEL on the Squibb executive-liner is typical of those in corporate aircraft; features omni, VHF, etc. Note the crew-devised check-off list *(close-up on page 32)* mounted on cockpit ceiling above co-pilot's position



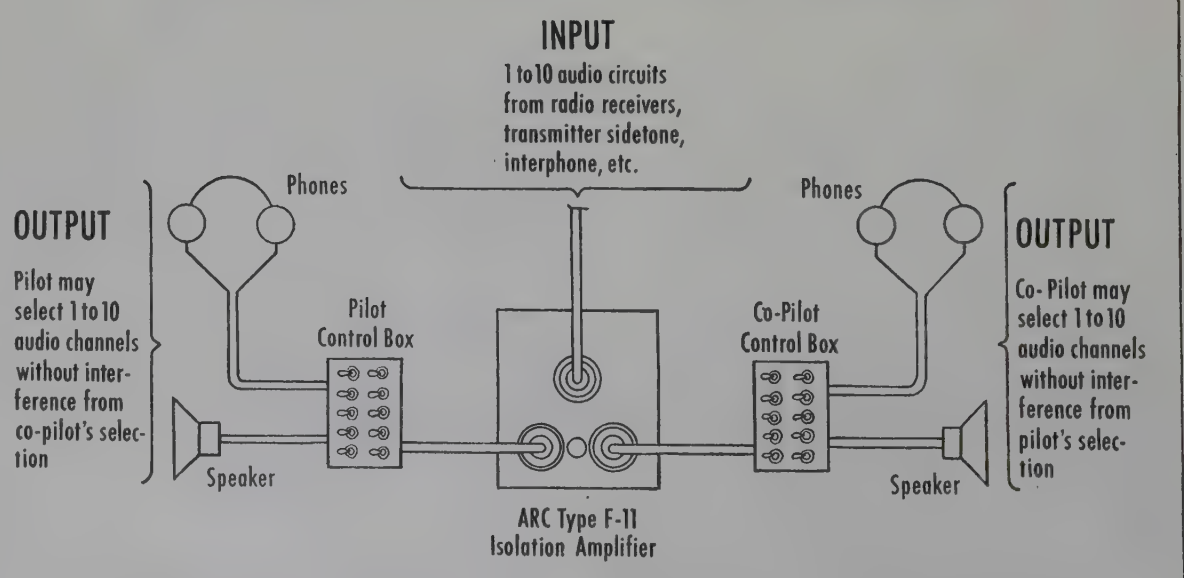
Mixing Amplifier

Isolation Amplifier permits independent selection of one to 10 channels by crew

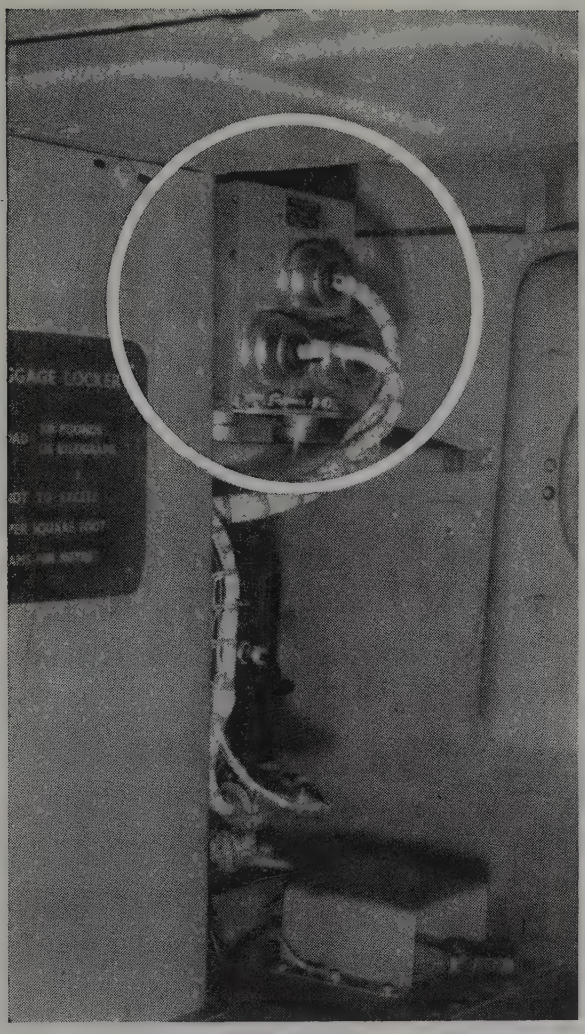
By HARVEY A. SENIOR

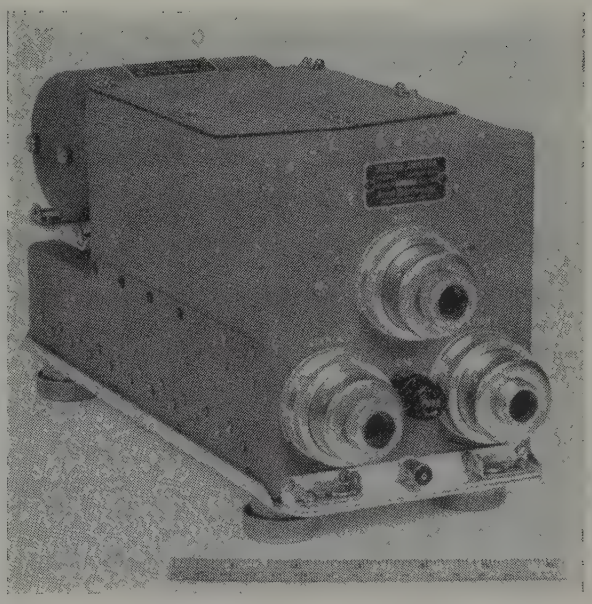
OVERHEAD PANEL is shown in this photo of radio installation in *Lodestar's* pilot compartment. Note crew selector switches *(A, B)*

Block Diagram of Isolation Amplifier Installation


INPUT
1 to 10 audio circuits from radio receivers, transmitter sidetone, interphone, etc.
OUTPUT
Pilot may select 1 to 10 audio channels without interference from co-pilot's selection
Phones
Pilot Control Box
Speaker
ARC Type F-11 Isolation Amplifier
Co-Pilot Control Box
Phones
Speaker
OUTPUT
Co-Pilot may select 1 to 10 audio channels without interference from pilot's selection

INSTALLATION of Isolation Amplifier permits independent muting of receivers; choice of speaker, headphone operation





ISOLATION AMPLIFIER *(above)* is shown *(left)* installed in the belly luggage compartment of a Lockheed *Lodestar*. All wiring between this amplifier and cockpit is d.c. Wires are not subject to cross coupling, noise pick-up

Complexity of the radio installation needed for operation of aircraft requiring a two-man flight crew, particularly under instrument-flight conditions, imposes a rather severe burden upon the pilot and co-pilot. Operation of the airplane along the airways and upon approach to terminal airports requires that each member of the flight crew shall monitor more than one, and often several, of the navigation and communication radio facilities. It is not difficult for each man to comprehend the informational output of one or two receivers, but handling the various audio channels of a modern installation of several receivers and transmitters imposes a severe hardship. The usual composite radio installation provides that each audio output be heard by both men.

A specific example may serve to illustrate how this factor directly affects the safety of the aircraft while aloft. We are winging along in very heavy haze at our assigned altitude under IFR on the assigned airway. The pilot and co-pilot are performing the many duties of checking position, weather reports, and the myriad other tasks of operating an airplane without external visual references.

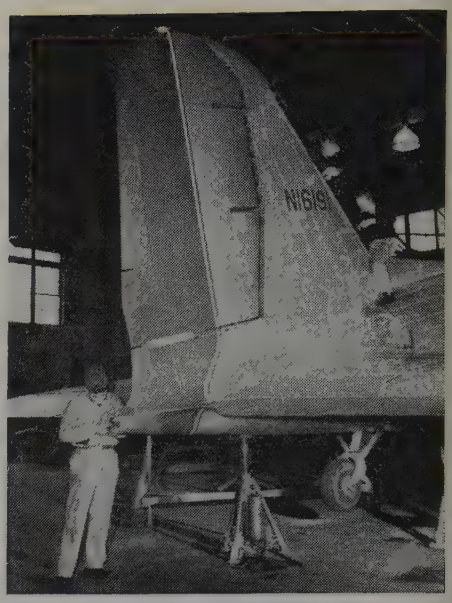
At the moment, the pilot is concerned with flying the airplane and the co-pilot is charged with making position reports, requesting clearances, etc. Each man is, therefore, listening to appropriate radio channels for accomplishment of his duties, but a few of the channels are heard by both men. Utmost concentration upon the part of the co-pilot is required, then, in order for him to hear the specific information necessary to carry out his duties in spite of simultaneous transmissions and other such distractions. The co-pilot is startled to hear a plane crew call in to say that they are holding at the approaching marker beacon, *at our assigned altitude*, awaiting clearance for proceeding to the localizer beam for let-down to the runway.

Our co-pilot grabs the microphone and informs Airway Traffic Control of the situation. The holding aircraft is directed to make an immediate climb. All's well that ends well—but the story might have been different had our co-pilot been less alert, or in case the call of the strange aircraft had been covered by a simultaneous transmission on another frequency.

Admittedly, the shortcomings of the radio installation, as described above, could be eliminated by having entirely independent radio systems for the pilot and the co-pilot. But such an installation would be most uneconomical in the matter of space and weight.

It is possible to attain a high degree of efficiency in almost any composite radio installation by running all audio signals through a multi-channel dual-output isolation amplifier. In brief, this means that adding a single accessory (*Continued on page 39*)

CONVAIR 340 is newest twin-engine transport designed for both airline and corporate use. Four are now in various stages of executive conversion. Work is being done by AiResearch



CORPORATION DC-3 is having de-icer boots installed, lighting system checked by Babb

SKYWAYS for BUSINESS

News notes for pilots and owners of the 8,000-plus airplanes for business

Company Interest High In Exec-Version Convair 340

Company interest is running high in the executive version of the *Convair-Liner 340.* Four are already on order and in various stages of executive conversion. The Arabian American Oil Company (Aramco) has ordered two, the Texas Company and Pratt & Whitney Aircraft, one each. The executive conversion work on these four is being done by AiResearch Aviation Service Company, Los Angeles.

The Aramco *Convair* will provide seating for 24 to 38 passengers. The aft section of the airplane has provisions for 32 seats or 16 double chairs, eight of which will be mounted on slide tracks for easy removal. The remaining eight sets of seats can be utilized as sleepers. The forward compartment includes a divan and two sets of double chairs with tables between.

The divans to be installed in the Aramco as well as the Texaco and Pratt & Whitney executive 340's seat three, have folding arm rests, and foam rubber seats and backs. When folded down into a berth, each divan will sleep two.

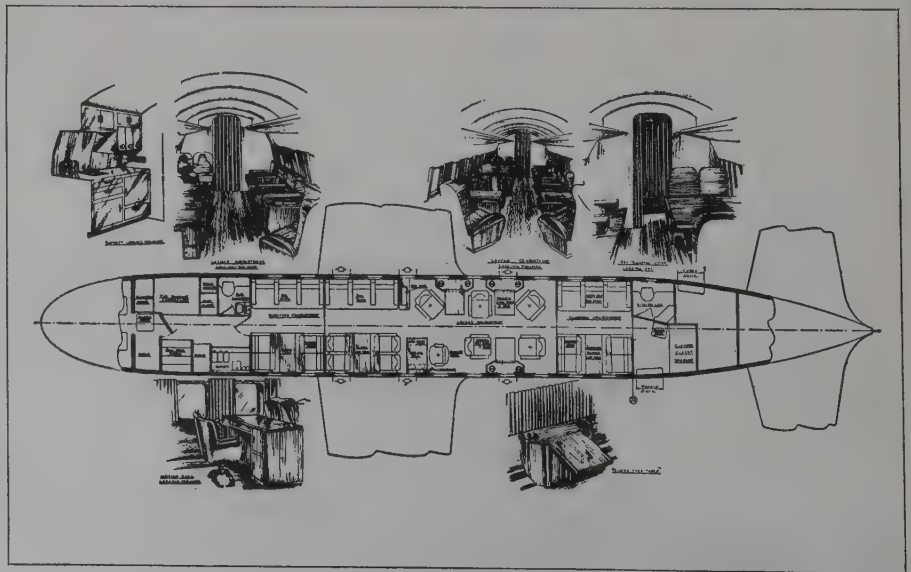
The Texaco *Convair-Liner* 340 will seat 27. Three divans will be installed in it, two in the forward compartment and one in the aft section. Four sets of berthable chairs will provide additional sleeping quarters for four, or seating for eight. The center section of the ship will have five full-swiveling chairs, three folding tables, a secretary's chair and desk, and built-in magazine racks.

Color scheme carried out in the Texaco 340 is gray and claret, with a gray plaid material for the seats and divans. Tan and beige vinyl plastic simulating leather will be used in the plane's two lavatories, one forward and one aft. Light-colored woodwork is to be used throughout.

The Pratt & Whitney *Convair-Liner* 340 will be similar to the Texaco plane, differing in seating arrangement in that it will have eight swivel chairs in the lounge compartment, and a single berthable divan in the forward section. Color scheme in this 340 will be shades of tan, with seat material of a knobby gray-tan mixture. The P&W 340 will carry 31 passengers, with a double row of chairs in place of divans in the aft section.

The *Convair-Liner* 340 is powered by Pratt & Whitney R-2800-CB16 engines. It has a gross weight of 45,000 pounds, and a fuel capacity of 1900 gallons. It is a product of Consolidated Vultee Aircraft Corporation.

EXECUTIVE CONVAIR for Texas Company features forward and aft sleeping quarters and center lounge area. This version of the *Convair 340* will carry 27 passengers in real comfort



Air Conditioning Unit Designed, Installed by Spartan

For extra cabin comfort, Phillips Petroleum Company had a refrigerated air conditioner installed in its executive A-26. Officials are so pleased with the results they are considering similar installations in other Phillips Petroleum aircraft.

The air conditioning unit, designed and installed by Spartan Aero Repair at its Tulsa, Oklahoma base, operates on either 24-volts or 110 volts. This permits operation of the unit by an external electrical supply while the plane is on the ground. Those who have flown in the Southwest during summer months will appreciate the on-the-ground cooling capabilities of the Spartan unit. For further information, write to Spartan Aero Repair, Tulsa, Okla.

Babb Company Wins CAA Approval as Repair Depot

The Maintenance Division of The Babb Company, Hangar 8, Newark Airport, N. J., has announced receipt of its approval by CAA. This makes Babb one of the largest CAA-approved repair stations in the East.

The facilities include a fully equipped Sheet Metal Shop, Prop Overhaul Shop, Radio Shop, Accessory Shop, Electrical Shop. Dope and Fabric Shop, Welding Shop and Tank-Sealing Department. In addition, The Babb Company has several warehouses with an extensive supply of all types of airplane engines, aircraft parts, and accessory spare parts. All of the maintenance personnel have A&E licenses and, being a Shell Oil Company dealer at Newark Airport, The Babb Company stocks a complete line of Shell Aviation Products. The Babb Company is currently engaged in turn-round maintenance and service for executive aircraft up to and including DC-6 type aircraft.

Cold in England, Put Heaters in Here

The weather in England produced a job for Mallard Air Industries in Bridgeport, Connecticut a few months ago. R. S. Reynolds Jr., president of Reynolds Metals Co., Richmond, Va., got off an airliner at New York International Airport (Idlewild) and walked hastily to the Reynolds Company DC-3, that had been waiting to fly him home to Virginia following his extended stay in England. After greeting the plane's pilot, R. O. Gragg, Mr. Reynolds asked, "Got my heaters in?" "Not yet, sir," replied Pilot Gragg, "we haven't needed them." To which Mr. Reynolds retorted: "Well, go up to Mallard and have them put in right away.... I froze in England." The DC-3 was subsequently flown to Bridgeport and the heaters installed. These heaters, by the way, feature a hand-formed air scoop developed at Mallard by Eric Ernst, former Chance Vought man now a part of the Mallard picture. Mr. Ernst's other "claim to fame" is the fact that he was the man who finally fixed the leaking ice box in Arthur Godfrey's DC-3. Many had tried, but it was Eric Ernst who was successful.

. . . in the Corporate Hangar

That true tall Texan, Herb Hanson, recently flew Atlantic Refining Company's newly converted DC-3 to its headquarters at Dallas. Chief Pilot Hanson saw the -3, Atlantic Refining's first, through its conversion by Mallard. Elaborate is the word for this new executive plane . . . it has everything but a bar. Company ruling says "no bars in Atlantic Refining planes." In addition to the DC-3, the company has a Twin-Beech.

The *Lodestar* belonging to Texas Eastern Transmission Corporation is at Spartan Aero Repair for several new installations, among them a new Sperry A-12 autopilot, an ARC-5/T-19 and T-23 transmitter, a 15B Omni receiver, Bendix MN-53B Marker Beacon receiver, two ARN-7 radio compass receivers, a BC-733D Localizer, and a Spartan SA-24 isolation amplifier. Pilots for the *Lodestar* are F. T. Nettles and T. C. Sallee.

Van Cott, chief pilot of the Koppers Coke Co. DC-3, flew the plane to Newark Airport to pick up Gen. Sommervell, president of Koppers Coke. While on the field, Van Cott had The Babb Co. overhaul the DC-3's starter.

Penn Wilson and Jess Collins, pilot and co-pilot of the Carter Oil Company's DC-3, brought the ship to AiResearch Aviation Service's shop at Los Angeles for a complete 8,000-hour overhaul and a new executive interior.

Champion Paper Company's Twin-Beech is back in service after a 5,000-hour inspection, an engine change, and the installation of an ARC-3 Transceiver. The executive D18S also sports a new gray and green cabin interior. Chief Pilot Dick Smith did the fly-away from Spartan Aero Repair at Tulsa, Oklahoma.

Jock Whitney is planning to hangar his DC-3 at Mallard's Bridgeport, Connecticut, base. Whitney pilot is Mel Holbrook. Other exec planes hangared at Mallard include Socony's two DC-3's and a Twin-Beech, Sinclair Oil's DC-3, National Lead's DC-3, National Dairy's DC-3, and Pressed Steel Corp's DC-3 and Grumman *Widgeon*.

John Rintoul, chief pilot of the Squibb DC-3, brought the plane to The Babb Company for rebushing of the landing gear and installation of de-icer boots.

Raoul Castro and Howard Ehlers, pilot and co-pilot of Square D Company's Lockheed *Lodestar*, brought the ship to AiResearch for tank sealing and general maintenance. Home base for Square D is Milwaukee, Wisconsin.

Hank Hart is the new co-pilot of the Oklahoma Contracting Corporation's Twin-Beech. He replaces Walt Mims.

Allan Block, pilot for Bankers Life & Casualty Co. *Lodestar*, flew the plane from Chicago to Dallas and Southwest Airmotive for 100-hour inspection.

Kirsch Company's Twin-Beech is at Spartan undergoing a double engine change, prop overhaul, installation of ARC-15C equipment, and a new blue and gray cabin interior. H. D. Burke is pilot of the Kirsch plane.

Charlie Cowan, chief pilot of the Pratt & Whitney *Lodestar*, brought the ship to The Babb Company hangar at Newark for repairs to its left wheel well hydraulic cylinder and a retraction test.

A. H. Bean flew the Olan Mills *Bonanza* to Southwest Airmotive for 100-hour inspection, and R. B. Dieter brought the Lofland Bros. Co. Twin-Beech in for electrical repairs.

Phillips Petroleum's Lockheed 12 is at Spartan for 1,000-hour inspection, double engine change and complete instrument overhaul. In addition the Lockheed is getting an ARC-5/T-19 and T-23 transmitter and an R-89 Glide Path receiver. While this work is going on, the interior of the plane is being re-done and Hardman "Siesta" chairs installed. Interior coloring is to be complementary shades of green; the exterior also is being repainted in Phillips' standard airplane colors.

Conversion work was completed at Mallard, Bridgeport, on Olin Industries' DC-3. Pilot F. W. Heaton recently flew the '3 back to its base at St. Louis.

CAOA REPORT . .

CORPORATION AIRCRAFT OWNERS ASSOCIATION, INC.

Corporation Aircraft Owners Association is a non-profit organization designed to promote the aviation interests of the member firms, to protect those interests from discriminating legislation by Federal, State or Municipal agencies, to enable corporation aircraft owners to be represented as a united front in all matters where organized action is necessary to bring about improvements in aircraft equipment and service, and to further the cause of safety and economy of operation. The CAOA headquarters are located at 1025 Connecticut Avenue, Washington 6, D. C.

New Members

Applications from the following operators of aircraft for business transportation were accepted at a recent meeting of the Board of Directors:

The Port of New York Authority, New York City. This is a corporate agency of the States of New Jersey and New York, set up for the planning and development of terminal and transportation facilities and to improve and protect the commerce of the Port District. The authority has jurisdiction over four major airports in the Metropolitan New York area—La Guardia, Newark Airport, New York International, and Teterboro. To facilitate travel of its executive personnel between these airports, the PNYA operates a Bell 47 D-1 helicopter. Theodore Leopold is the pilot, and Fred M. Glass, Director of Aviation Development, is the CAOA representative.

Ingram Products Company, Nashville, Tenn. This company is engaged in petroleum transportation and operates a Beechcraft D18S, based at Berry Field. Captain R. O. Blaisdell (ATR) is the pilot.

Amis Construction Company, Oklahoma City, operates three Cessna 195 airplanes in connection with heavy earth and concrete construction work performed at various locations in all sections of the country. Total time is estimated as over 2,000 hours per year. Emmett R. Morris (ATR) is the chief pilot, and partners W. D. Amis and/or R. T. Amis, Jr. (also pilots) will represent the company at CAOA meetings, etc. Floyd L. Spear is the office manager.

Running out of Snow

CAOA Chairman Cole H. Morrow at a New York State aviation conference at Syracuse made the point that although the corporation-owned and operated segment of civil aviation had attained a remarkable growth during the past five years, he was afraid that "this snowball of growth is about to run out of snow. We have just about reached the point where there are no more larger type aircraft such as DC-3's, *Lodestars*, PV-1's, etc., available for additional corporation use. Owing to military production requirements, output of the Twin Beechcraft is limited to about one per week. The 100 *Twin Bonanzas* in the 1952 program have all been sold in advance, with firm orders backed by substantial deposits. Some 100 of the new *Aero Commanders* are also in the schedule, and advance orders have been taken on practically all of these. However, there has not been any new type of medium-sized aircraft developed specifically for the corporation market in this country, and the only ray of hope we have for additional corporate aircraft in the immediate future is the use of British designs and British manufacture."

Mr. Morrow has already shown considerable interest in the De Havilland *Dove* (*see his brief "pilot's report" on the CAOA page, SKYWAYS, December 1950, page 36*). More recently he has expressed an interest in the De Havilland *Heron* (*see photo*), which is essentially a four-engine version of the *Dove*, with 14 seats as against eight. The four *Gypsy Queen* 30 engines are rated at 345 hp each, but permitted to 370 or 375 hp after the first overhaul. The prototype *Heron* has been flown for over 500 hours, including a period of normal scheduled airline service with British European Airways last summer, during which an excellent economy record was reported. Arrangements are under way to make it available in this country, and indications are that it would make a satisfactory medium-weight corporate aircraft.

Regional Representatives

The Directors of CAOA have recently initiated an important step to make its organization more effective to its members in all parts of the country. A CAOA representative will be designated for each of the seven CAA Regions for liaison with the Regional Administrator, and his various division chiefs in the fields of Operations, Program Planning, Safety, Installations, etc. This representative will be advised of all forthcoming meetings, such as Air Space Use Committees, meetings for discussion of radio aids to navigation and air traffic control, and will be in a position to see that such gatherings are attended by CAOA member-company officials and pilots to represent the Association's viewpoint.

The Air Transport Association has had such liaison for some time by means of its four Field Offices, located in New York, Chicago, Fort Worth and Los Angeles, covering respectively, CAA Regions 1, 3 and 5, 2 and 4, and 6 and 7.

Mr. Charles F. Horne, CAA Administrator, has heartily welcomed the proposal and has promised CAA cooperation all along the line.

Automatic Approach

A growing number of corporate aircraft are being equipped with automatic approach equipment, of which the Sperry A-12 Gyropilot, the Bendix PB-10 Flight Path Control and the Lear L-2 with approach coupler are best known. The entire fleet of Sinclair Refining Company's multi-engine planes, including Twin Beechcrafts, DC-3's and *Lodestars*, are equipped with the Sperry A-12 with Auto Approach. The company's information booklet *Flying with Sinclair* (available in each airplane to be read by passengers flying with Sinclair for the first time) has a paragraph on the subject of Automatic Landing which explains it very simply.

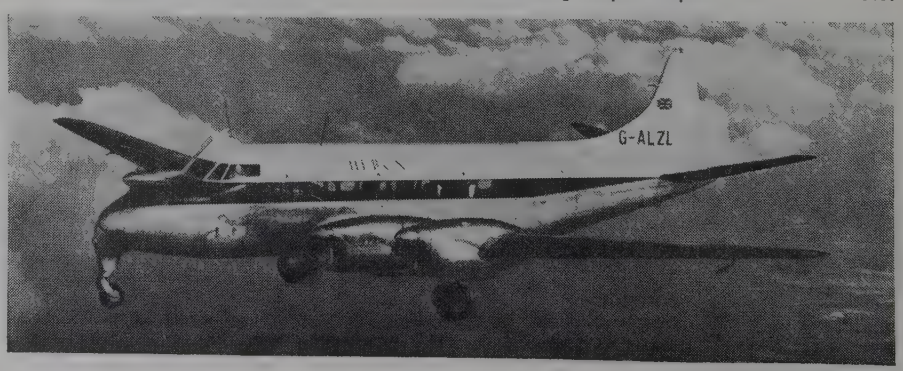
After brief paragraphs outlining the method of controlling Altitude, Attitude, Turns & Banks & Direction by means of the various elements of the A-12 system, the following notes are given on Landing:

"The final landing approach of an airplane even under favorable conditions is a difficult and complex phase of modern flight . . . Under bad weather or instrument conditions, these problems are not only more difficult because there is no visual reference to the ground and landing strip with which to check, but they are further complicated by the additional task of manually following an instrument landing procedure.

"Automatic Approach equipment has been designed to simplify flight-control operations during this critical time and to control a plane with a minimum of attention and a maximum of accuracy and safety. Automatic Approach equipment "slaves" the plane to the two radio beams of an instrument landing system (ILS). One, the "Localizer" beam, holds the plane on a course co-incident with the center of the runway; the other, the "glide path" beam, holds it in a glide at the correct angle for the landing approach, thus eliminating the possibility of missing the approach . . . This takes guess work out of an operation where a battling average of 1000 is absolutely necessary.

"The plane in which you are now flying has all of the automatic equipment discussed above!"

DE HAVILLAND HERON might find a good market among corporate-plane users in the U.S.



Mixing Amplifier

(*Continued from page 35*)

unit, about the size of a range receiver, to an existing radio system will permit separate selection of up to 10 pieces of equipment by pilot and co-pilot without mutual interference between used and unused channels. Thus, each man will hear *only* those channels which he has selected.

The F-11 Isolation Amplifier manufactured by Aircraft Radio Corporation, Boonton, N. J., provides a means of integrating almost any aircraft radio installation into a highly efficient and practical system. All amplifier components are contained within a sheet-metal housing and the complete assembly is mounted upon a shock-mounted radio rack for ease of accessibility. Connections are made by means of multi-wire ceramic-insulated connectors plugged into receptacles mounted on the front plate. A dynamotor provides high voltage for plate circuits of the vacuum tubes contained in the amplifier.

Since all audio signals pass through this amplifier, it has necessarily been made fail-safe, *i.e.*, in the event of partial or complete failure, holding relays drop out and provide a means of by-passing the amplifier. While a noticeable loss in signal strength is obtained under by-pass condition, this loss is not sufficient to impair operation of the system and the receivers can be shared by pilot and co-pilot as before installation of the amplifier. Normal amplifier operation provides more than adequate volume levels for headphone or loudspeaker operation.

The F-11 isolation amplifier is capable of handling 10 audio input circuits. All audio switching is done by relays located in the bottom portion of the amplifier chassis. Relays permit use of short unshielded leads between receivers and amplifier.

Two of the input circuits are divided in such a way that the outputs of two receivers can be terminated in two range-voice filters. Pilot and co-pilot can then select independently any combination or range, voice or both filter outputs without mutual interference. A suitable hook-up permits using a single range-voice filter on one amplifier channel with independent selection of range, voice or both by pilot and or co-pilot. No cross-talk will result if both users are connected to the same circuit, but there will be a slight (3 to 6 decibel) reduction in output. If this cannot be tolerated, the use of separate filters is recommended.

A vacuum-tube amplifier contained in the isolation amplifier provides sufficient output power to drive individual loudspeakers for the pilot and co-pilot, thus eliminating the fatigue of wearing headphones. Selection of headphone operation is obtainable at the flip of a switch.

It is desirable to cut off or mute all incoming signals during transmission. A muting relay permits cutting off any amplifier channel or group of channels for receiver muting as desired. The muting relay is operated by the microphone key circuit when the button is pressed to talk.

The isolation amplifier may be placed in the radio compartment, adjacent to the various radio units concerned. In this way, short lead length is obtained between receivers and amplifier.

System-control boxes for the pilot and for the co-pilot are mounted in the cockpit so as to be readily accessible. Each control box contains a set of selector switches (for choosing the desired audio channels), a microphone jack, and muting relay. Outlets for headphones and speaker, as well as their control switch, may be located on the control box.

All wiring between amplifier and cockpit is d.c. and high-level low-impedance audio. These wires are not subject to cross coupling or noise pickup.

In brief, then, a complete installation permits independent selection of from one to 10 audio channels by pilot and/or co-pilot, independent muting of receivers, and choice of speaker or headphone operation. The design of the amplifier unit is such that an input signal of 300 mw will produce 3 watts output for loudspeaker operation.

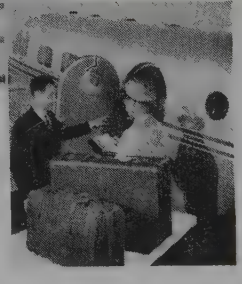
At this time it is felt that the 10-channel amplifier is adequate. Another such unit can be added as the need develops.

Editor's Note: *Beginning in an early issue of SKYWAYS, Mr. Senior will bring to our pilot and plane-owner readers detailed descriptions and operational information concerning specific items of electric and electronic equipment necessary in today's business aircraft. Mr. Senior is an authoritative figure in this field and we call upon his experience to bring you the facts in aircraft electrics and electronics.*

Incomparable

a pretty girl

It is a commendable thing, indeed, for a young lady to arise bright and early on New Year's day to compose her good resolutions. However, there's a limit to how far one should go in such matters, and we heave a sigh of relief that Barbara Phillips has decided to strike out that last entry on her list. She is 21, has green eyes and brown hair, likes to fly, and raises Boxer dogs.
(No. 4 in a series of pretty Dallas girls discovered and photographed especially for Southwest Airmotive).



Incomparable

The Prompt, Courteous Service
You Get on The Ramp at
Southwest Airmotive

SOUTHWEST AIRMOTIVE COMPANY
LOVE FIELD • DALLAS

Air Navy . . .

(*Continued from page 12*)

the West Coast All-Weather Squadrons.

The most important job of the all-weather fighter pilot is, of course, his tracking down and destroying enemy aircraft. Once Ground Control Intercept gives him the general location of the enemy craft, he is on his own and uses the plane's radar to close in within gun range of the target. It is essential, therefore, for the pilots to constantly practice following targets via radar. However, this sort of practice under actual bad weather or night conditions could be extremely dangerous. The only other way for the pilots to obtain this necessary practice, then, is via some sort of synthetic trainer where, without ever leaving the ground, they would encounter all the difficulties and problems normally encountered in the pursuit of an enemy target. The special devices center at Sands Point, Long Island, designed and built one, known as the Radar-Link Trainer. This ingenious electronic device which allows the pilot to practice his mission in absolute safety is housed in a small building of its own on the Base. In one room is a standard Grumman F8F Link Trainer to which has been added an airborne intercept radar unit, the type used on squadron aircraft. The F8F Link trainer was pressed into the service because no F4U or F2H Link was available at the time the trainer was devised. This room can be darkened and the sliding hatch of the F8F is painted, leaving the trainee alone and in darkness, just the way he would be on an actual flight. In a second room sits the Radar-Link operator. Through a system of electronic controls, the operator can put a "target" indication on the trainee's radarscope, and control the course, speed and altitude of the simulated enemy craft. On his own control panel scope the operator is able to watch the movements of both the target and trainer craft, thereby checking the proficiency of the trainee.

On a panel in front of the operator, a group of instruments duplicates the readings of the flight instruments in the trainer's cockpit, and another group simulates the readings that would be found in the "target" craft. This complete unit, costing about a quarter of a million dollars, is one of very few in existence today, and it is the only place where the pilots can get practice in using the gun-aiming device. Each pilot is required to put in a certain number of hours each week in this Radar-Link Trainer.

Like its Air Force counterpart at McGuire Air Force Base (SKYWAYS, *June 1951*), VC-4 maintains a 24-hour standby alert ready to intercept, upon signal from a Ground Control Intercept Station, any unidentified aircraft reported in a specified area. A standard GCI station, manned by 25 men under the command of Lt. Comdr. J. R. Riggs, Fleet Air Detachment GCI officer, is maintained at the Atlantic City NAS. The job of this unit is to locate enemy targets and develop enough information to enable the ground controller to direct his interceptor aircraft to within range of the interceptor plane's own radar. A Plan Position Indicator (PPI) shows all air and, in some cases, ground targets. Information received on the PPI is transferred to the Vertical Summary Plot Board which shows all air activity in the radar surveillance area. Often you will find the pilots spending their off-hours—and they haven't many of them—watching the proceedings and even taking a hand in the operations.

The other operational all-weather squadron based at Atlantic City is Composite Squadron Thirty-Three (VC-33), commissioned in June, 1950 and commanded by Cmdr. Robin M. Lindsey. The primary mission of VC-33 is to conduct strikes against ground or sea targets under all conditions. This includes night and all-weather attack. Very often VC-33 will have fighter cover supplied by VC-4.

The aircraft used by VC-33 is an assortment of various models of the Douglas *Skyraider*, powered by a Wright R-3350 *Cyclone* (2700 horsepower). Armament consists of two 20-mm cannon, and a miscellany of HVAR and bombs, depending on the mission. Some of the *Skyraiders* carrying the brunt of the Navy's air support and strike missions against the enemy's strong points in Korea are marked with the familiar "Sugar Sugar" (SS) of VC-33. There are about 15 versions of the *Skyraider*, and VC-33 has a goodly share of them, all the way from the AD-1 to the AD-4Q.

While there may be no apparent difference in the external appearance of the various AD's, there is a considerable difference in the communications, navigation and attack equipment carried by the various versions. Each craft has its particular function and, although there are about a dozen different duties to which these AD's are assigned, servicing and maintenance difficulties are kept to a minimum by using only one basic type of aircraft for all work. One particular version, the AD-4N series, is used by the Navy's airmen for night attack and anti-submarine work.

Although the AD is a single-seater, the Q and N versions have a radar operator's position located below and behind the pilot, with an entrance door on the starboard side of the fuselage.

VC-33 is eagerly awaiting delivery of the AD-4NL, which is a winterized, all-weather job with a larger radar unit especially designed for attack craft. It will also carry a searchlight to illuminate ground and surface targets. The proficiency of VC-33 in night illumination with flares is well known in Navy circles. Their specific contribution to the endless stream of modification and improvements emanating from this all-weather base is a sono-buoy dispenser which they modified so that it would carry flares that could be dropped at the touch of a button. It performs so well that it may soon be adopted for use on all service craft of this type. To complete VC-33's complement of aircraft, a Beech SNB-3Q has been equipped with electronic countermeasure equipment of the training of the AD crewmen. The man responsible to a large degree for the efficiency and high morale of this organization is energetic Captain C. T. Booth, skipper of VC-4 and the Commander, Fleet Air Detachment, Atlantic City. Capt. Booth is a pilot with 4,000 hours to his credit, all in military aircraft.

Lt. Cmdr. K. D. Smith, Squadron Administrative Officer, VC-4, and leader of the jet team, is one of those fellows who was born to fly, particularly the *Banshee*. One of the first night-fighter pilots, "KD" has logged about 3500 hours in military aircraft, 450 of which has been in jets. He has been very active in the development of night-fighter and all-weather techniques.

It is interesting to note that of all the officers in this detachment, very few are not pilots. In addition to their daily flying, these men operate various other units, do administrative work, engineering, concern themselves with the mission and housing of the personnel, and perform all the other duties necessary to the perfect operation of their squadrons. It is this interchange of duties that affords the men a wider knowledge of the operation of the various components that are required to complete their mission, and leads to a greater efficiency in the over-all operation.

Through hard work, perseverence, and constant practice, the men of VC-4 and VC-33 have been instrumental in the continued development and approach to perfection of this phase of Naval Aviation. Thanks to these men and countless others like them, the U.S. is afforded greater security.

ALL-WEATHER CORSAIR is this F4U-5NL, fitted with de-icer boots on wings, tail surfaces, windshield, propeller. Engine is 2500-hp P & W. Note radar unit installed starboard wing

No Wings and a Prayer

(*Continued from page 13*)

schedule at NAMC, Philadelphia, was for a few X-rays. We were stretched out half-naked on a very cold table under an X-ray machine. Photographs were made of the spinal column from the head halfway to the toes. No one told us why, so the consensus was that these were the first in a set of "Before and After" illustrations.

After the X-rays, we were shown a movie on the art of ejecting one's self from an airplane. It was very interesting, showing how one's spine contracts two or three inches under the shot accelerations and how the wind flaps one's cheeks and ears.

A short time later we had a talk with an officer who was setting up the training program. He told us that ultimately all pilots of jet aircraft would be required ("allowed" was the word he used) to take the practice shot. Some of us asked the most obvious question, "Why?"

It seemed that the Air Force, who put ejection seats into service some time before the Navy, was having a little trouble with pilots who were reluctant to use the contrivance, preferring to bail out conventionally and hoping to live through the probable beating. Apparently the test shots in which the dummy pilot lost arms and legs had received more widespread publicity than the shots after which the dummy required only minor repairs. The training program was expected to convince the pilots that the ejection seat was really the nicest way out.

It was my opinion that the answer to this problem was an appeal to the pilot's head, not to the other end of his spine, and this opinion was shared by the other volunteers. I intended to use the ejection seat when the occasion arose. I had seen what happened to two pilots who did not. The rest of the volunteers felt the same way. One said, "Might as well practice parachute jumping!"

"That's a good idea," said the training officer, "I feel that every pilot should make a practice parachute jump." Now pilots aren't paratroopers. Parachutes are for emergencies encountered in the primary business of driving combat aircraft. Why practice parachute jumping? If the practice jump is successful, one obviously doesn't need the practice. If the practice jump is not successful, one obviously won't need the practice.

To give the devil his due, however, (referring to the training officer and hoping he will overlook my casual use of the French language) a lot of pilots have been lost because they didn't take to their chutes in time, if at all. There does seem to be a general reluctance in the majority of pilots to leave an airplane, so general that an accident report from a pilot stating simply, "My engine caught fire—I bailed out," caused quite a lot of comment in the Bureau of Aeronautics. It turned out that this pilot had tried to land a burning plane previously and had been severely burned in the process. He was one pilot who warmed up rapidly to the idea of using a parachute at the proper time.

Anyhow, we didn't talk anyone out of "letting" us get ejected so we were unceremoniously told to return two days later after the X-rays had been studied to make certain that our spines were sound.

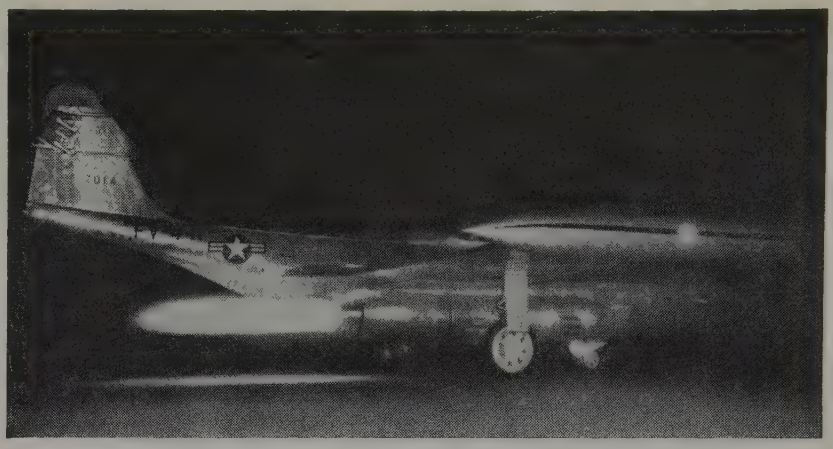
In due time we were introduced to the trainer itself. It was like a small railroad track sticking straight up about 80 feet. At the bottom was a reasonable facsimile of a pilot's seat. It had all of the familiar doodads on it; the head rest, the firing screen, the foot rests, etc. The training cycle consisted of strapping the pilot in, loading the seat with a 37-mm shell, and allowing the pilot to fire the seat by pulling the wind screen down over his face. The shell goes off, the seat and pilot go up, and the seat is arrested at "maximum range" by a ratchet mechanism. The pilot releases the ratchet and is lowered considerably slower than he was raised.

I watched the first shot to see what it was like. The first man was strapped in and given instructions. Then the boss, chief gunner or whatever he is called, stepped back and held up one finger, then two fingers, then three fingers. When the three fingers go up, the victim is supposed to pull the wind screen over his face immediately, firing the seat. Actually, the master gunner could have gone through four or five more fingers before that screen went down. When it did, there was a bang, a whiz, and the formerly untrained pilot was hanging 47 feet up the track, thoroughly trained.

After the first shot, I hung around for the rest of the morning to see if I could get used to the whole idea. Failing in that, I went for a light lunch and returned in time for my ordeal.

The seat was well warmed up when I was strapped in. Having been a shipboard gunnery officer at one time, I was thinking about that shell in the hot firing chamber warming up for a record-breaking bang. The master gunner went through his routine instructions and with a few test pulls I tested the face screen for size. I was determined to pull that screen the instant I saw three fingers. I had watched the preceding men dilly-dally after getting the high sign and I wanted no part of that seeming indecision. I was afraid my better judgment would win out and embarrass me. The crew completed the preparations and the master gunner stepped back. I was lonely. Up went one finger. I concentrated on getting the F4U kinks out of my spine. Up went two fingers. The sky darkened, noises seemed to die away, and the wind picked up. I tensed all my muscles and waited. This is one way to get up in the world, I thought. Then the three fingers and it was my turn. I said to myself, "Pull it fast, Smith," but at the same time I thought that maybe there was a mistake, that maybe the boss didn't really want three fingers up yet, that maybe it wasn't me he was signalling to anyhow. But I was wrong each time and, since everyone was waiting for me to carry the ball, I did the right thing by the Bureau of Aeronautics and pulled the damned screen.

Thinking back on what happened in the next instant, I recommend that a transparent face screen be used so that a student can observe what goes on while he is being trained. It was dark where I was, except for the rockets and bursting starshells. And it seemed as if a tremendous giant hit me with the heel of his hand on the back of my head while booting me a lusty one on the other end. I skinned my rather prominent nose and chin on the canvas face screen. The next conscious recollection I have was feeling and hearing the seat clicking to a stop. Then I had a faint taste of how the ostrich must feel. I didn't want to let go of the screen and come out into the world. Maybe I expected to find a row of harps or something, maybe it was because I don't like bright sunlight. I let go of the screen and took stock of the situation. I was approximately 50 feet in the air, roughly five stories high. It was really a good view and quite cool but, feeling a trifle conspicuous, I released the catches and allowed myself to be lowered gently to the ground. I was trained.



Fired Scorpion

A 15-foot stream of fire blasting from its twin-jet afterburners outlines this F-89 *Scorpion* against an inky black sky. The afterburners give the *Scorpion* extra "push" for take-off and when maximum performance is needed for short intervals in flight. They inject raw fuel in metered quantities into the plane's searing exhaust stream and give the plane added power to get upstairs in a hurry for interception of the enemy.

GRUMMAN ALBATROSS is now referred to as a triphibian. Designed as an amphibian, the *Albatross* recently was equipped with a small outrigger ski on each float and a retractable ski mounted on the bottom of the redesigned hull, making it possible for the rescue plane to operate on snow and ice as well as land and water. AF designation for the 14-place *Albatross* is SA-16A

Combat Chasers

(*Continued from page 17*)

plane playing an important role.

In one instance, an L-5 pilot on patrol spied a group of North Korean soldiers marching along a road very near the front-line area. He radioed the information to a nearby group of U. S. infantry, then led them toward the spot. The Reds were quickly captured and disarmed. The lightplane pilot took over then. He skittered back and forth at an altitude of 50 feet, buzzing stragglers, and eventually delivered the whole lot of prisoners to a rear-area stockade.

Though slow and unarmed, one of these little lightplanes often commands fire power that would make the combined bomb and rocket load of our biggest bombers seem like a peashooter in comparison. It is estimated that lightplanes, while cruising over the target area, have directed approximately 85 per cent of the artillery fire in the Korean campaign.

In this type of work, the pilots usually maintain about a 2,000-foot altitude. This keeps them out of range of small-arms fire, yet they are still low enough to see clearly what is going on. During actual shelling of an enemy target, they must remain on a flank to avoid being hit by one of our own guns.

Major Michael J. Strok, an "Army Aviator" himself, described one such bit of action during a recent visit home. "The grimmest and most effective bit of spotting done in Korea while I was there involved a column of North Koreans approaching a crossroad. An aviator directed 16 guns on the point, had one salvo dumped on the lead elements of the column, switched a battery to the enemy rear, then played the other guns up and down the road on the troops between."

It's hard to name a campaign function in which these little half-pint airplanes have not participated. "You name it and we will do it," seems to be the slogan of these flying businessmen. In one grim instance, food, water, ammunition and medical supplies were dropped for five consecutive days until a battalion of foot soldiers, isolated in the hills, could fight its way out of a North Korean trap. The lightplanes have been used extensively for evacuating seriously wounded from front-line first-aid stations. In one case, while directing a fighter-plane strike, the Army pilot saw an F-51 pilot bail out of his damaged airplane. He did what has become a natural thing for these Army Aviators to do. He landed in enemy territory, picked up the downed Air Force man, then took off again before the North Koreans could gather their wits and do anything about it.

Not all missions, however, are desperate adventures for these Army business men. Sometimes the little airplanes are actually put to the uses for which they were intended. Their slowness and the low altitudes at which they fly make them excellent vehicles for front-line photography. They are used to lay telephone cable at a mile-a-minute while flying at tree-top level. During rapid advances, when the foot soldiers outstrip their communications, the lightplanes keep the advancing units in contact with each other, while at the same time scouting ahead for blown bridges, or enemy traps and road blocks. It is estimated that a single lightplane will do the work of 20 jeeps in courier service and for carrying messages.

Army Aviators don't have much time to loaf. The variety of missions they accomplish means usually that another job is waiting as soon as one is finished. Some aviators have accumulated as many as 180 hours of flying time in a month—an average of six hours a day. The average U. S. commercial airline pilot logs about 75 hours during the same 30-day period, and doesn't have to dodge bullets while doing it. One lightplane pilot (name not available) sports an Air Medal with 29 clusters—one cluster for each 10 missions completed.

Most missions are short, usually of two or three hours duration. But lightplanes are notably short of automatic controls. There is no automatic pilot to "spell" the Army Aviator while he stretches is arms and yawns. He's flying every minute he's in the air. Then there is the element of surprise to contend with—an enemy anti-aircraft battery at an unexpected place, and enemy air action is increasing along with the tempo of the war. After six hours under such conditions, the pilot is ready for a rest, but too often he doesn't get it. Many of the boys have flown nine and 12 hours a day for two weeks at a stretch. It's a tough go, but griping is noticeably absent among the Army Aviators who have volunteered.

Major Strok says: "If you know of worse flying conditions than those in Korea, I don't want to hear about them. Korea is a land of mountains and rice paddies—that's all. The aviators can't fly off hillsides, so they do what they can with the paddy-land.

"The surface of these rice paddies is usually six inches of mud. You should have a 1,000 feet of runway for an L-5, and 1500 for an L-17 *Navion*. Some fellows have gotten off in 600 feet, although it's not clear exactly how they did it.

"Then when aloft, the cold air freezes the mud caking your landing gear. You fly your mission, return home and prepare to let down. Is the landing gear locked in place? The frozen switches will never tell you. Unless you get an indication from the ground, you come in ready to make a pancake landing.

"Of course," the Major continues, "you can always take off or land on one of Korea's few roads—if you can get a mechanic to halt truck traffic long enough. One fellow I know took off with a string of railroad box cars on one side of him, a wall of supplies on the other, and trucks crossing his path fore and aft."

One Army pilot was forced to set down in an ammunition dump. He picked his way neatly between piles of TNT until he hit a pothole. Then the airplane nosed over and came to rest on a crate of 105-mm shells.

After-dark landings are another problem, but they don't seem to worry the Army Aviators too much. You can't use floodlighted runways in the front-line area. But many pilots will stay out after dark, then come back with the excuse that they were "enjoying a good shoot." On moonlight nights, these late comers can usually "feel out" the blacked-out air strip; on darker nights, thoughtful ground personnel will set out a couple of C-ration cans filled with burning gasoline.

Seemingly not satisfied with land duty only, a few Army Aviators have lifted their lightplanes off carrier decks while at sea. The first man to accomplish this feat under combat operational conditions was Capt. William B. Capps, General Almond's personal pilot. Capt. Capps was given an assignment to affect a rendezvous with Gen. Almond shortly after the latter led a landing force

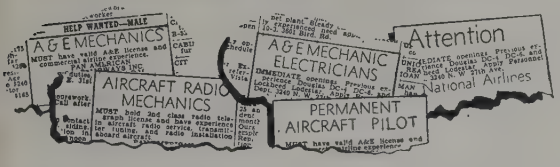
(*Continued on page 60*)

NOW IS THE TIME

TO TAKE THE STEPS THAT WILL GIVE *You* LIFE-TIME SECURITY IN AVIATION!

Embry-Riddle

RIGHT NOW...TODAY...OPPORTUNITIES FOR TRAINED AVIATION SPECIALISTS ARE "GOING BEGGING"! ONE YEAR FROM TODAY, THE DEMAND FOR CAREER MEN IN THE AVIATION INDUSTRY WILL BE EVEN GREATER!



We can offer you *definite proof* of the above statement... or, to prove it to yourself, watch the "Help Wanted" columns of any of the big city newspapers. Aside from the fact that there *are* many many jobs open in aviation today, the future requirements of this tremendous, rapidly-growing industry will assuredly grow far in excess of the number of men available and qualified to fill the jobs.

THIS IS YOUR OPPORTUNITY...AND NOW IS THE TIME TO PREPARE FOR IT!

Embry-Riddle training is by far your quickest, surest road to the opportunities in the aviation industry. Complete eight-month to two-year Embry-Riddle courses in every phase of aeronautics are tailored to the practical and exacting aviation industry requirements.

YOUR EMBRY-RIDDLE GRADUATION CERTIFICATE INSURES YOUR CAREER OPPORTUNITY!

You learn fast and well at Embry-Riddle. You work with live aircraft in vast shops and hangars...with the finest instructors...with the finest equipment available anywhere. If military service interrupts your studies...you're still a long way ahead of the crowd.

If you are now a high school student or a recent graduate, it will pay you to investigate at once the full advantages and guaranteed career security of Embry-Riddle training. Don't delay...write for complete information today.

THESE COMPLETE EIGHT-MONTH TO TWO-YEAR EMBRY-RIDDLE COURSES ARE TAILORED TO THE PRESSING DEMANDS OF THE AVIATION INDUSTRY!

AIRCRAFT & ENGINE MECHANICS

Vast numbers of *properly* trained A & E Mechanics are urgently needed. Our C.A.A. approved school with a quarter-century experience assures your quickest advancement. Embry-Riddle students learn fast with modern equipment, including jet...live aircraft, airline-size hangars.

AERONAUTICAL DESIGN AND TECHNOLOGY

Embry-Riddle's accelerated 26-mo. Aeronautical Design and Technology Course provides finest training available. Technicians with management responsibility enjoy highest salaries!

COMMERCIAL PILOT

Embry-Riddle trained pilots benefit from our years of experience with 30,000 students...the best instructors, up-to-date aircraft, superb year-'round flying weather. Also Instrument and Instructor's ratings.

A & E COMBINED WITH COMMERCIAL PILOT

Airmen with *dual* pilot-engineering ability are needed by aviation companies and operators. Embry-Riddle *combination* training offers you the most in your aviation career.

ELIGIBLE VETS STILL ACCEPTED UNDER G.I. BILL OF RIGHTS

CLASSES ARE BEGINNING NOW...SEND THIS COUPON TODAY!

Embry-Riddle International SCHOOL OF AVIATION MIAMI 30, FLORIDA

Dean of Enrollments - Dept. 93
Embry-Riddle School of Aviation
Miami 30, Florida

Please Print

NAME _____

ADDRESS _____

City _____

State _____ Age _____

I am interested in...

- ☐ A.&E. Mechanic
- ☐ Commercial Pilot
- ☐ Aeronautical Design and Technology
- ☐ A.&E. Combined with Commercial Pilot
- ☐ A & E Combined with Private Pilot

Check One ☐ Veteran ☐ Non-Veteran

TRAIN IN MIAMI — AIR CAPITAL OF THE WORLD

Long Way is the Shorter

(*Continued from page 15*)

too interesting. I think I'll take a look at the southern route," I remarked.

"I've been pondering the same idea," said the dispatcher. "Let's look at it together."

As soon as we were satisfied that the line squalls would not spread south of Wichita, we filed a flight plan on the southern route.

On high-altitude cross-country flights, an airline Captain can deviate from the regular airways at his own discretion but limited by company regulations. Anything above 16,500 feet is considered open territory—except for the current security regulations on flight plans. From these higher altitudes, we are never out of radio contact with a half-dozen ground stations.

You'd be surprised how far from normal course an airline Captain will wander these days to stay out of rough weather. I'll go several hundred miles off course anytime to keep out of a thunderstorm. One night a DC-6 out of Omaha went into what appeared to be a thin layer of stratus, but the smooth clouds were stuffed with rough cumulus clouds. The extreme turbulence blew out an inspection door and decompressed the airplane. The pilot made a fast 180° and finally broke into the clear where a fast-building cold front had formed vertical cloud formations to 50,000 feet—all in the space of a few minutes.

While the added speed is important, we do most of our pressure-pattern flying to stay out of rough weather. The best possible way to keep your passengers coming back for more flights is to give them a smooth ride. Nobody likes to be tossed around in flight, particularly when they have to pay for the experience.

When the airlines first began flying DC-6's and "Connies," pilots would report in at high altitudes with 120-mph winds that didn't show up on any of the low-altitude weather maps. The flight dispatchers frequently called back for an additional position report, but now they are accustomed to these freaks of nature.

High-altitude "Raywind" (radar wind direction and velocity) reports now make pressure-pattern work possible over land. Over-water flight crews have been using the same principle for several years, ever since the radio altimeter was perfected and installed. By comparing the difference between the radio altitude and the old fashioned barometric-pressure altimeter, it is easy to find the pressure, high or low, at that location. Virtually all over-water flights are now planned to take advantage of tailwinds due to large air-mass pressure changes.

When this type of flying first started, there were some close calls. A very good friend of mine was flying a converted B-24 back to the States from Honolulu during the war with 30 litter patients aboard. Pre-flight briefing gave him a course to fly that was supposed to skirt the southern edge of a low-pressure area to take advantage of tailwinds. The night was rainy and overcast all the way, so the navigator couldn't make any star shots. LORAN would not cut through the rain, so the flight continued on its pre-calculated heading. At dawn, however, the navigator was able to get a sun-line and the boys found themselves well past the point-of-no-return without enough gas to make shore. The pilot leaned out all the mixture controls and cruised for maximum economy. The gas gages hit bottom before land was sighted and two engines quit—out of gas—as the plane came in over the Golden Gate Bridge. The B-24 barely sneaked into Mills Field—and without enough fuel aboard to taxi off the runway—all because there was no radio altimeter to check the progress of the low-pressure area that drifted from north to south of course during the time the plane had been in the air.

U.S. ARMY Cessna C-126C is military version of the Cessna 195. Because of its having to operate out of unprepared fields, it is equipped with crosswind gear

A Navy training syllabus titled "*Pressure-Pattern Flight*" lists this account of a springtime crossing of the North Atlantic in ideal weather:

"*Perhaps it was this pleasant weather, rather than the incredulity of the navigator, that caused him to disregard the indications from the pressure values that were regularly calculated and recorded. Relying on dead-reckoning and sun-line positions, the course was regularly plotted and wind corrections made. The corrections were not made on the basis of pressure gradient, but on the last weather map obtained before departure. And how was he to know that the center of the high was intensifying and the gradient on the eastern side increasing? True, it had not been forecast!*

"*A daylight crossing, the trip was uneventful and for all indications, the estimate was being made good. However, when the first star appeared and a celestial fix was obtained, the position was plotted to be several hundred miles south of the dead-reckoning position, and to reach destination it was necessary to fight a 90 to 100-knot headwind. A 12-hour flight plan actually became a 16-hour-and-25-minute flight, and before continuing to destination, it was necessary to land at an alternate field in North Ireland for fuel.*"

On the delivery of one of KLM's new *Constellations* from the Lockheed factory near Los Angeles, A. K. Showalter, Chief of the Los Angeles Weather Bureau Office, helped chart a course that would pick up 100-mph tail winds across the North Atlantic. The KLM pilots were planning a *non-stop flight from Los Angeles to Amsterdam!* The flight had to have an average tailwind of 50 knots all the way to make good. Courses varied all the way from Hudson Bay in northern Canada to directly over New York City. Finally, the most southern course was selected and the flight took off from Burbank. They arrived over New York ahead of schedule, but an hour out over the Atlantic, the crew received a radio message to return to New York. "One of our company ships is down at Gandor. Will you please come back to New York and pick up parts." This was the only reason the non-stop flight didn't work out.

Pressure-pattern flying was used by Paul Mantz and Joe deBona in the Bendix races a few years ago. A careful choice of altitude and course was the difference between winning and finishing out of the money.

The 14 U. S. Weather Bureau Aviation Forecast Centers and the 20 CAA Flight Advisory Stations prepare this upper-air data. Every six hours an upper-air chart is prepared for winds up to 20,000 feet. Regular CAA communications stations carry the results of these surveys, but do not have the maps available for study.

Lately, other factors have come into the pressure-pattern picture that can add materially to the speeds obtained. The most recent wrinkle is horizontal "jet streams" that will beat the pants off our schedule. A "closed cold low"-pressure area may stretch out for 300 to 500 miles that will cause a true river of air that can go either up or down hill. One flight I made recently from Los Angeles to Denver on Airway Red 6 (the roughest run in this country) showed winds of better than 100 mph over Bishop, California. I could see ice crystals from over Mt. Whitney at 40,000 to 50,000 feet hit the desert southeast of Death Valley and dig up dust off the ground.

In the 30-odd years that I've been flying, I've seen a lot of changes in this aviation business. The most important, I believe, in selling mass transportation to the public is this current study of pressure-pattern flying to give the passenger a smooth ride for his money. When I took over Charles Lindbergh's air mail job from St. Louis to Chicago on the old CAM-2 (Contract Air Mail) in 1926, the only winds we were interested in were right on the deck. Later the old Pacific Air Transport—now United Air

Lines—needed a Ford Tri-motor pilot and I went on the Los Angeles-San Francisco run. There our interest in winds never went beyond 10,000 feet to clear the mountains of the Ridge Route. During World War II, I flew with Consairways in B-24's and C-54's from San Francisco to Brisbane, Australia. Here we were interested in winds to 15,000 feet and very definitely interested in long-range pressure-pattern flying. We would fly more pressure-pattern work in six weeks over the Pacific Ocean than I do in a year over land. However, it was the advent of truly modern airplanes, the pressurized DC-6's and *Constellations,* that put the pilots in a position to really utilize their weather knowledge.

Without modern equipment, what good would the knowledge be that the southeast corner of a nocturnal thunderstorm is usually the roughest quadrant at high altitudes?

Here's a little example of how carefully airline Captains treat their passengers. On a recent Chicago flight we hit a line squall near Grand Junction, Colorado. The clouds were piled up too high to top, so I turned south of course to pick my way through a hole in the front. Just at the south edge of the occluded front we were passing, I found a reasonably wide break in the towering cumulus near Mt. Peal. As we cruised through this opening, I counted five other transports heading for the same spot—and we were all over 50 miles south of course.

In skirting the towering nimbo-cumulus "anvil head" clouds, practice has shown the smoothest air to be under the anvil head where the turbulence is subsiding. Here there is usually a mild down draft, but relatively smooth air. It is not good practice to go in too far under the anvil head, just around the edges, since heavy hail can be found in this area.

On a westbound flight from Chicago three years ago there was a solid line of tornados from Colorado to Nebraska. I detoured south of the area to Guadalupe Pass near El Paso, Texas. This flight took off 30 minutes late, but by changing flight altitudes to pick up tailwinds, we arrived on time in Los Angeles. We stayed high as far west as Gage, Oklahoma, and then went down low until we reached the great plateau of New Mexico before climbing back to altitude.

When I walk into the United Operations Office in Chicago, I have a number of problems in the back of my mind. The Midway Airport, while quite adequate, has not the largest runways in the world. We normally have headwinds most of the way west and if the ground temperature is hot, we can't take off with any more than a safe margin of fuel for a non-stop flight to Los Angeles. Figure your weather wrong and there's a bothersome, expensive unscheduled landing and you arrive not minutes but hours late. That's when I ask the forecaster for the latest 500-millibar chart and plan my flight from there. If the winds show any help, I may go all the way up over Green Bay, Wisconsin and Boise, Idaho and then turn south over Sacramento, California to actually approach Los Angeles heading southwest—ahead of schedule.

That old adage of a straight line being the shortest distance between two points is no longer true. Just like an attractive movie starlet, the best distance between two points is a gracefully curved line, but we curve them around low-pressure areas high in the air.

When the news wires carry a story of some airline breaking an existing record on a long-distance flight, it is a sure bet that the Captain was flying a pressure-pattern flight plan with a detour or two to pick up an upper-air jet stream.

This new technique opens up a completely new style of flying. The transport pilot, the executive pilot on long-range hops and the private pilot with auxiliary fuel tanks—all have a whole new choice of courses that they never had before—both for speed and comfort. Today, it is a rare flight that is rough on our DC-6 passengers.

There is a good chance that we have only scratched the surface of this pressure-pattern flying. As more and more information becomes available on flights approaching the tropopause (30,000 to 50,000 feet), it appears that the whole west-to-east pattern of air flow, as we know it in the United States, may reverse itself at these higher altitudes. Just think of the efficiency of flying eastbound at the lower levels with a steady tailwind. Then turn around and fly back westbound at tropopause levels—with a tailwind again!

I believe the silky-smooth flights, pressure-pattern planned, represent the greatest single advancement in post-war aviation.

TABLE I

	Present Piston Engine	Ducted Fan	Piston Engine Aircraft to Duplicate Performance of Ducted Fan
Cruise Speed	170	270	270
Cruise Range—Miles	680	680	680
Miles Per Gallon	18	5.8	4.2
Weight of Aircraft	1625	1625	3400
Weight of Power Plant	600	300	1400
Horsepower—Take-off	200	450	900
Weight of Fuel Required	230	700	970
Cost of Aircraft (Estimated)	18,000	22,000	50,000

Turbines, Small Planes

(*Continued from page 23*)

blasted out rearward and in the velocity imparted to the air. The propeller-piston engine moves a great quantity of air at a relatively low velocity, while the turbojet propulsion engine moves a relatively small quantity of air at high velocity. In order to know how the turbine should be utilized, it is profitable to examine a special kind of powerplant yardstick called "propulsive efficiency." This is concerned with the velocity with which the air is expelled rearward. The zero efficiency point corresponds to operation on the ground with the brakes locked, in which case the engine operates and produces thrust but accomplishes nothing useful since the aircraft does not move. At the other end of the propulsive efficiency scale, the power produced is very small even though the efficiency is high.

It so happens that a turbine is able to give the high-speed rearward blast necessary for high-speed flight with much greater efficiency than the piston engine and propeller and this is the basic reason that jet-reaction turbines are used in our high-speed military aircraft. Conversely, in a slow-speed aircraft, the propeller is best since it is basically a low-velocity, large mass-flow producer. Between these two means of propulsion, the ducted fan possesses advantages in the mid-speed range (*Fig. 2, page 23*).

One factor to consider in evaluating the propulsive system is the engine itself or the energy-generating means. The present state of development of the turbine is such that the fuel consumption is greater than the piston engine. Within the foreseeable future, the fuel consumption of the small turbine will be improved to the point where there will be little difference in fuel consumption between the two, but this is some time off. In the meantime, there is no reason to delay turbine application to production aircraft since superior performance can be obtained using present turbines. Such secondary advantages of the turbine as low weight, reduced frontal area, no cooling power loss, and other factors, add up to enough to more than offset the present high-fuel consumption disadvantage. The curves of Fig. 2 illustrate the point that a turbine of either the jet-reaction or ducted-fan variety has less fall-off in thrust with increased speed than an engine connected to a propeller.

Before continuing further in the statement of the case for the turbine, let's consider the various ways a turbine may be used.

First—and the simplest of turbines—is the pure jet-reaction type as used so brilliantly by military aircraft. This is the powerplant for high-speed aircraft and is very poor choice for aircraft in the 100- to 400-mph class because of poor propulsive efficiency at low aircraft speeds.

Second is the shaft turbine. This type is excellent any place where piston engines are now used, *i.e.* fixed-wing aircraft, helicopters, and convertaplanes.

Third is the ducted fan, which is the same as a shaft turbine but with a fan connected instead of a propeller. This type is excellent for the mid-speed range, *i.e.* 200 to 400 mph, and is the most prominent contender for commercial or executive aircraft powerplant application since 200 to 400 mph is the

(*Continued on page 46*)

Turbines, Small Planes

(*Continued from page 45*)

natural speed range for this type of aircraft.

Fourth is the air-bleed turbine. In this case, the useful work is extracted from the turbine in the form of compressed air which can be used for special purposes, such as a helicopter with rotor-tip jet thrust where the compressed air is led to the rotor tip and then directed rearward to give jet thrust. This type and the ducted fan also may be used for producing high lift from the aircraft wings at low speeds by boundary layer control.

All of these four types are essentially the same engine with various features added, and this versatility is one of the attractions of the turbine.

Examples of all four of these types (jet reaction: *Marbore II;* shaft-turbine: *Artouste I;* compressed-air: *Palouste I;* ducted-fan: *Aspin*) have been developed and are now offered to the aircraft industry by Continental.

All the turbines have common features—single-stage, centrifugal compressor of 3½ compression ratio, annular combustor of extreme compactness and high efficiency, and axial-flow turbine having one-stage in the case of jets and two in the case of shaft turbines. Other features are: fuel thrown out from the rotating shaft eliminating multiple spray nozzles with their high-pressure fuel systems, air-cooled turbine nozzle, link-type bearing support giving centralization of turbine rotating parts in the stationary housing under temperature expansion dimension changes, and very stiff turbine shaft resulting in freedom from vibration troubles. All these turbines have long endurance records—and these records form the basis of the statement that the turbine, even at its present state of development, will be more reliable than the piston engine. And in the future, even greater turbine life is expected.

Figure 3 shows the power losses in a typical piston-propeller aircraft. Some of these losses can be avoided with the turbine. It is obvious that these losses may not be important at low speeds, but at 300 mph, 33 per cent of the engine power is waste.

Figure 4 summarizes the results of one study showing how the gross weight of aircraft varies with speed. In the case of the piston engine, various losses not present in the turbine make it necessary to use greatly increased power which, in turn, requires increased airframe to support it. The net result is an aircraft of at least twice gross weight for the same performance as compared with the ducted-fan jet-reaction turbine aircraft.

Summation of all these factors is shown in the results of one design analysis (*Table I, Page 45*). Examination of this table shows that the use of the ducted fan results in an aircraft possessing all the essential features of present day reciprocating aircraft, except that it has 60 per cent greater speed. A piston-engine aircraft with performance equal to the ducted fan would require a reciprocating engine of 900 hp (maximum, 700 at cruise) and an airframe of considerably greater weight, the total resulting in greatly increased cost, as shown in the extreme right-hand column of the table.

A ducted-fan aircraft would probably include these features: pressurized cabin to permit flight at 20,000 feet, wing-tip fuel tanks, flush rivets on a good section of the wing and fuselage, extra large flaps, streamlining as good as jet fighter, extra precautions to reduce wind noise, and wing root engine air intake.

Flight in such a plane would be free from engine noise and vibration, and most flights could be made over the weather—all of which would result in much greater passenger comfort. Cabin pressurization is easily accomplished with turbine powerplants, since air at the required pressure can be bled from the turbine. Safety would be improved since the fuel would be carried in a location far removed from the passengers and the powerplant. In addition, the rear mounting of the engine would be an added safety feature. Access to the plane's cabin would be greatly improved by the low cabin door ahead of the wing, and a considerable weight saving would be made possible by the low landing gear structure permitted in the ducted-fan turbine aircraft.

The turbine can also be used on slower prop-driven aircraft, with the turbine installed in the nose of the plane. Here the result would be more power for a given weight aircraft or less weight for the same power. However, in this case the turbine possesses the handicap of greater fuel consumption so that the weight saving could only be exploited for short-duration flights. Of course, all the secondary advantages of the turbine remain, *i.e.* low weight, reduced frontal area, no cooling power loss, etc. A summation of powerplant evaluation is given in Table II (*below*).

Another promising field for turbine-powered aircraft is in the twin-engine executive aircraft category. The ducted fan would probably be mounted just aft of the cabin, about in the center position in the fuselage. Here again the outstanding difference between the turbine and the piston-engine aircraft would be in increased speed at cruise.

In the 400- to 500-mph class, the turbine should be the jet-reaction-type exemplified by the *Marbore II.* Two of these turbines could be used in one aircraft intended for military training. This plane could also be built as a high-speed, two-place personal aircraft, although the cost would be about twice that of a 300-mph ship.

Finally, the question may be asked, "how much will it cost and when will this be available to the flying public."

As to costs, it is estimated, based on production of experimental quantities, that the turbine powerplant can be made at a cost per horsepower equal to that of the present piston engines. This estimate is conservative. Others, not so conservative, freely predict costs substantially less than piston engines of equal power.

Availability depends, as in all industries, on the demands of the buying public. This discussion is in the nature of a preview of things to come. Whether or not they finally do come depends on how appealing the improvements offered are to aircraft users. In any case, military use of these small turbines will almost certainly precede commercial application; therefore, prediction in these days of rearmament, as to when personal aircraft powered by turbines will become a commonplace sight on airports, is extremely uncertain. It is probably sufficient to state at this time that a start has been made and the goals described are attainable today.

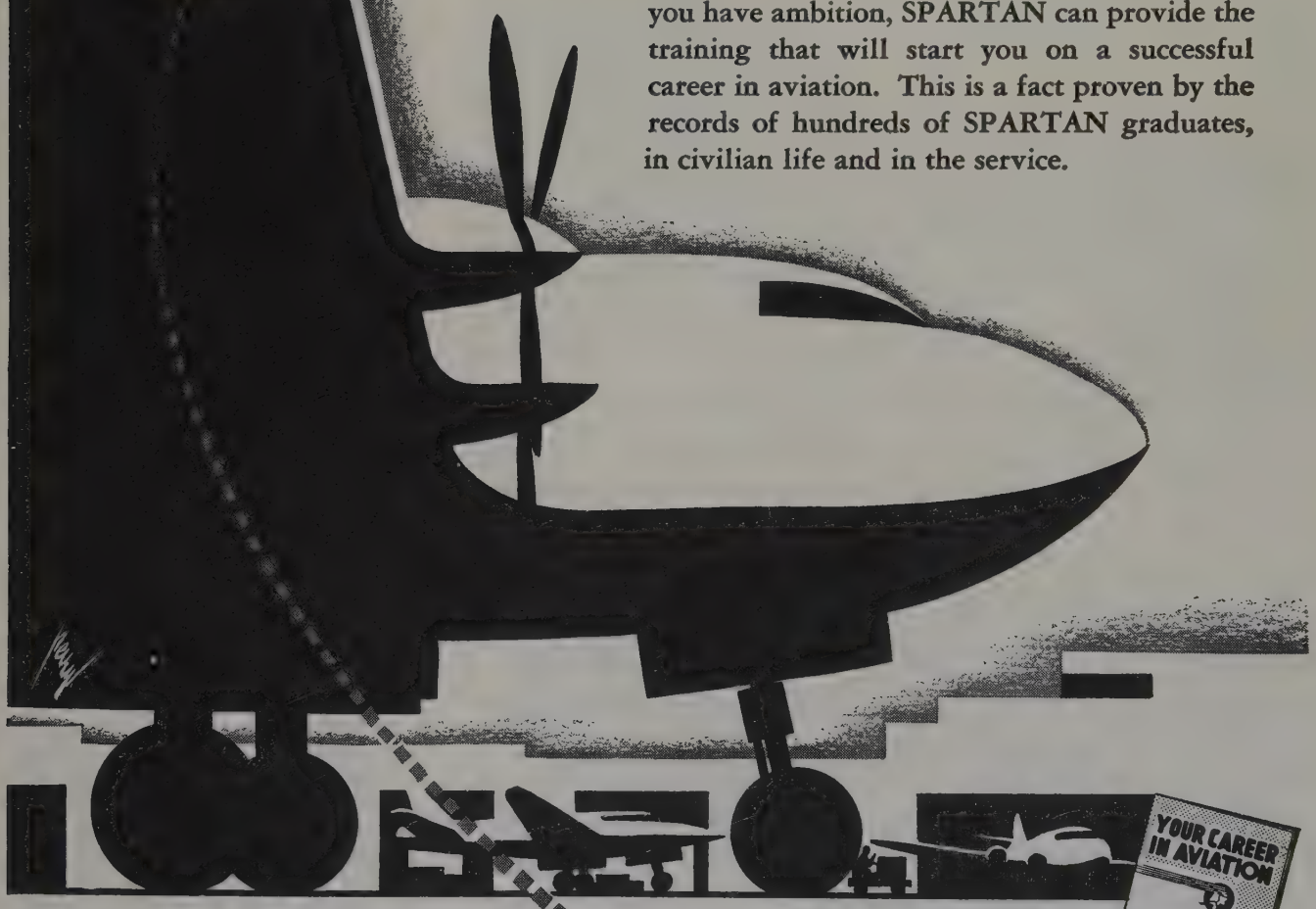
TABLE II

POWERPLANT EVALUATION

Based on 300-mph 4-place aircraft, each type especially designed for its powerplant. (First choice indicated by 1)

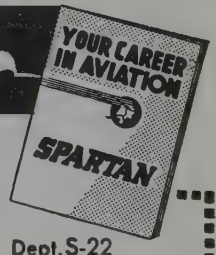
	Piston With Prop	TURBINE		
		With Prop	Ducted Fan	Jet Reaction
Weight	4	3	2	1
Fuel Consumption	1	3	2	4
Oil Consumption	2	1	1	1
Wear of Parts	2	1	1	1
Time Between Overhauls	1	1	1	1
Vibration	2	1	1	1
Noise	2	1	1	1
Safety				
a. Ice Problems	2	1	1	1
b. Fuel Volatility	2	1	1	1
c. Engine Location	2	2	1	1
Cooling Problem	2	1	1	1
Cost	3	2	2	1
Torque Reaction	2	2	1	1
Effect of Air Temperature	1	2	2	2
Warm-up Time	2	1	1	1

ABILITY plus SPARTAN TRAINING equals SUCCESS IN AVIATION



Few people succeed without ambition. If you have ambition, SPARTAN can provide the training that will start you on a successful career in aviation. This is a fact proven by the records of hundreds of SPARTAN graduates, in civilian life and in the service.

Find out what SPARTAN training has done for others and what it can do for you. *Write today for complete information. It will be sent you promptly.*



SPARTAN
A UNIVERSITY OF AVIATION
SCHOOL of AERONAUTICS — MAXWELL W. BALFOUR, DIRECTOR
COLLEGE of ENGINEERING — ADDRESS DEPT. S-22
TULSA, OKLAHOMA

Maxwell W. Balfour, Director
Spartan School of Aeronautics Dept. S-22
Tulsa, Oklahoma
Please send your free Catalog immediately.

Name_____ Age____

Address_____

City_____ State_____

Indicate which of these branches interests you.

☐ Flight ☐ Instruments
☐ Mechanics ☐ Aeronautical Engineering
☐ Radio ☐ Airline Maintenance Engineering
☐ Meteorology ☐ Flight Engineer

Spartan is approved for training under the G. I. Bill of Rights

Props are not Expendable

(*Continued from page 19*)

up too much California fog. It's out of balance."

Herb taxied to the local Serve-Yourself hangar where he could do the work under the eagle eye of an A&E. He pulled the prop and dried it overnight in a tight box heated with an ordinary 100-watt bulb. The propeller shop then pressure-glued the laminations together, and a new coat of varnish was applied. The trouble was over. In most cases, the first symptom of propeller trouble will be vibration when operating at the higher speeds. Such vibration may be very slight at first, and may be attributed to sub-par engine operation. But when inspection of the engine fails to reveal anything amiss, such as pre-ignition, detonation, loose engine mount, etc., the next logical step is to inspect the propeller.

Another sign of prop trouble is a curious whistling noise that changes its pitch with propeller speed. This is generally caused by surface damage on the prop which creates a turbulence in the air wash. The whistling sound can be caused by a loose metal tip, a splinter of wood about to break away, or bad warpage. All such unusual propeller sounds should be investigated immediately.

Complete propeller inspection should be accomplished along with every pre-flight inspection. It doesn't take long if the inspector knows what to look for. The most common defect to occur is small nicks and dents in the leading edge and face of the blades caused usually by gravel and small stones kicked up by prop wash during take-off. If it's a metal prop, the principle effect of such injuries will be very slight impairment of propeller efficiency, though a deep, sharp-bottomed nick may result in stress concentrations of sufficient magnitude to endanger propeller strength. On wood props, the nick and dents are no serious menace in themselves, but as they rupture the coating of varnish, this may permit moisture to enter the wood and result in blade unbalance.

Another defect to watch for during inspection of wood propellers is separation of the laminated sections. These laminations are pressure-glued together during propeller manufacture, and when the glue line fails, they are bound to spring slightly apart. This ruptures the varnish coating and permits the entrance of external deteriorating elements. Such rupture cracks may be hairline in size and very careful scrutiny is required to notice some of them. Aside from permitting moisture to enter, a sizeable lamination check may permit splinters of the blade to break away during highspeed operation. This will cause severe vibration, and if the splinter is large enough, may result in structural damage to the airplane or engine.

The metal sheathing on the tip and leading edge of wood propellers should be inspected for nicks, dents and looseness. Expansion and contraction of the metal during weather temperature changes, or expansion and contraction of the wood during wet and dry weather, will often cause the soldered screws holding the metal in place to become slightly loose. The tip may feel secure to the hand, but if there is a thin separation line in the finish along the edge of the metal where it contacts the wood, it should be called to the attention of a competent mechanic.

Though the propeller may appear to be structurally sound, every pilot should be able to recognize signs that will indicate the wood has been absorbing moisture. Even though the blades may absorb equal amounts and thereby remain in balance, the presence of the moisture is harmful to the wood and may weaken the glue lines holding the laminations together. Moisture absorption may be logically suspected when the propeller finish is in poor condition. On the other hand, if during a previous overhaul the propeller was painted with a non-water-resistant grade of varnish, the finish may appear intact, but will permit moisture to enter and leave the underlying wood.

In this latter case, and if excessive moisture is present, the blade surfaces will probably appear pitted underneath the varnish coating. This is caused by the moisture working up from the wood and bubbling up under the varnish film. When portions of the blade surface appear darker than other portions, it is almost a certain sign that moisture is present. In fact, the darkness in certain areas may be due to beginning propeller rot. When any of the above conditions exist, they should be investigated immediately. If it is determined that moisture is present in the wood, the propeller should be removed, the old finish scraped away, the propeller dried, then refinished and balanced. It is always a big gamble with safety to ignore such a propeller condition.

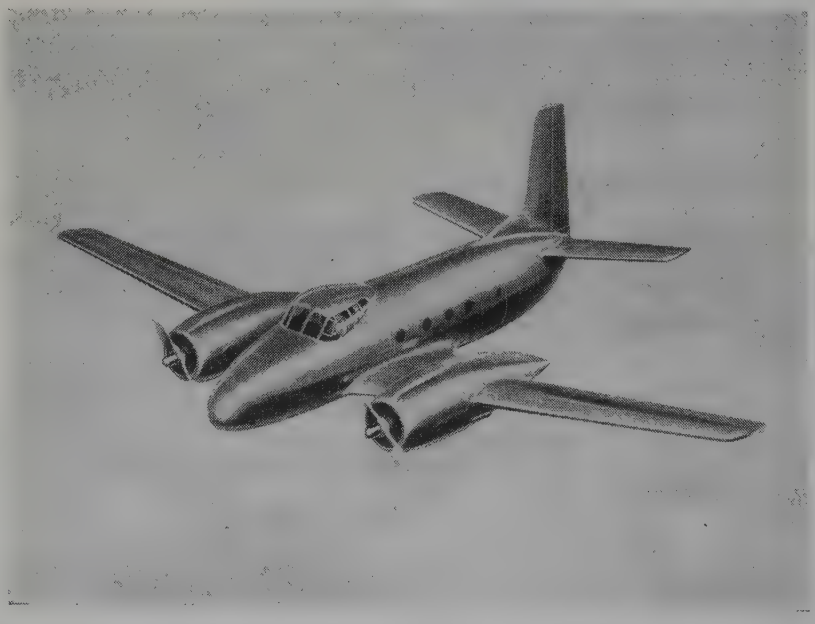
Out-of-Track Blades

Another factor that will cause propeller-induced vibrations, and that will have a serious effect on propeller efficiency, is out-of-track blades. This condition may result from slightly bent metal blades or warped wood blades. Improper mounting of the prop hub on the crankshaft will also cause mistracking. In a few instances, after the blades have been checked for alignment and the mounting seems secure, a bent crankshaft may be suspected.

Checking for out-of-track blades is a simple procedure. With the airplane at rest, drive a pointed stick into the ground with the upper end just clearing the tip of one propeller blade. Now turn the other blades into position and check the clearance. Repeat this performance with the stick's upper end just clearing one blade about 8 or 10 inches from the tip. If the clearance varies more than ⅛-inch either at the tip or farther back on the blade, the propeller is sufficiently out-of-track to require attention. Make this prop test on a still day so that the airplane is not being rocked slightly by a high wind.

Metal props are easier to check than wooden props. Out-of-track blades, or bent blades, may be checked by the pointed-stick method mentioned above. There is some danger of misconstruing apparent defects on a metal blade. Sometimes what appears to be a slight crack will be visible on the metal surface. Such areas should be swabbed with a 20 per cent sodium hydroxide (caustic soda) solution, then rinsed thoroughly with clean water. If a crack exists, the etching action of this solution will make it plainly visible; if what appears to be a crack is but a line of dirt or stain on the metal, the solution will etch it away.

Though efficient propeller inspection does not require a great deal of experience, determination of the seriousness of the fault is another matter. Whether to have the propeller repaired locally, returned to the factory, or scrapped as unsafe for further use, should be left to the judgment of a licensed mechanic. The point here is that the pilot



New Beechcraft T-36

One of the Air Force's newest aircraft is this twin-engine T-36 advanced trainer-transport. Powered by Pratt & Whitney R-2800's, it has a top speed of more than 300 mph, combat radius of over 650 miles. It is designed for a crew of four.

must notice the fault before it is called to a mechanic's attention.

More serious lightplane propeller faults include: (1) long, wide or deep cuts parallel to the grain in wood blades; (2) cracks or deep cuts across the grain; (3) separated laminations (in wood blades); (4) oversize or elongated bolt holes in the hub (plugging and reboring of these holes is not permissible); (5) warped or bent blades that affect track or pitch; (6) cracked or damaged shanks on adjustable-pitch propellers; and (7) cracks or sharp-bottomed nicks in metal blades.

Correction of propeller structural faults should not be attempted by the pilot himself unless he possesses a strong mechanical bent. Some major faults may be repaired locally, but more often the propeller will have to be returned to the factory or forwarded to a major repair facility. Minor jobs, including the removal of small dents and nicks, propeller refinishing, and sometimes the correcting of out-of-track blades, can be accomplished by any pilot with a mechanical turn of mind.

When the blades are out-of-track, yet do not seem to be bent or warped, tightening of the bolts on one side of the hub may correct the situation. It is also permissible to use thin metal shims between the propeller boss and hub in an attempt to align the blade tips. If both of these remedies fail, the job should be turned over to a licensed mechanic.

A small riffle file and sandpaper can be used to remove minor nicks and dents. The injury should be rounded out with the file, removing as little metal as possible, then smoothed by sandpaper polishing. If the nicks are very small, propeller rebalancing will not be necessary, but when sufficient metal is removed to affect the weight of the blade, rebalancing will be necessary. Most repair shops are equipped for prop re-balancing work.

With metal props, it's a good idea to burnish the blades occasionally to facilitate inspection for cracks. This can be done either by hand or using a small motor-driven wheel. A very fine grade of polishing paper or a paste-type rouge should be used.

Wood Props

With wood propellers, the chief maintenance job is one of occasional refinishing to prevent moisture absorption with consequent blade unbalance and danger from wood rot. This job can be accomplished by any pilot and does not require much equipment.

First, remove the propeller from the airplane and scrape away all old varnish. Do not use chemical or solvent removers, as these materials will leave a wax-like coating on the blade surface which prevents maximum adherence of the new coating. The next step is to dry the propeller thoroughly. This can be accomplished by hanging the prop in a dry shop area for a week or so (during dry weather), or can be speeded by enclosing the prop in a wood box along with a small light bulb. Using this technique, the prop will dry in about 48 hours. Temperature of the box should not be allowed to exceed 100° F., or the structural glue line may be damaged.

Prior to applying the new finish coating, fill all dents in a wood blade with plastic wood, and iron out dents in the metal tipping with a dolly and hammer. Inspect the screws and rivets holding the metal tip in place. If the screws are loose, it will be necessary to remove the solder anchoring them to the metal, then install screws a size larger and re-solder. Loose rivets can usually be tightened by peening of the rivet head. If the metal tip is cracked, or if it must be completely removed to iron out dents, it is advisable to turn the job over to a mechanic.

While refinishing may not result in unbalance, it is advisable to make a test for unbalance before the prop is re-installed. Most repair shops are equipped to do this work. A mandrel with protruding ends is inserted into the hub of the prop, and the protruding ends of the mandrel are supported on knife edges. This will allow frictionless rotation of the propeller in the direction of the heaviest blade. Horizontal balance is obtained by adding solder to the metal on the light end. Vertical balance is best obtained by adding putty on the light side of the hub until balance is obtained, then weighing the putty used and replacing it with a thin lead plate and screws of equal weight.

With the prop re-balanced, the pilot himself may proceed with the refinishing work. First, a good grade of wood filler should be rubbed into the surface, then all excess filler wiped away. Two or three coats of high-grade spar varnish should be applied, with thorough drying between coats. Two paint brushes are handy—one to apply the varnish, the other kept relatively dry to wipe away excess varnish and prevent runs. The work should be accomplished in a clean, dust-free room, and preferably on a warm, dry day. Drying time between coats can be shortened by using the heated wood box described.

When remounting the propeller, tighten the hub bolts evenly, in a zig-zag manner, first on one side of the hub then on the other, drawing each bolt only a partial turn at a time. A torque wrench should be used if available. Even tightening will draw the hub evenly against the boss, with less danger of the blades being out of track. Tighten the bolts firmly, but not enough to embed the metal plate in the wood. Make certain that all bolts are saftied, then make a final check for blade and tip track.

This article is not intended as a short-course in propeller maintenance. Frankly, unless the pilot knows his way around with a wrench and screw driver, all propeller work should be turned over to a competent mechanic. It's not a job for half-way measures. But the mechanic does not enter the picture until propeller inspection reveals something amiss. It is up to the pilot, regardless of his mechanical ability, to note when propeller attention is required.

Yes, propellers may be doomed. Jets may relegate them to museum shelves and showcases. But until that Doom's Day arrives, pilots who ignore their props may doom themselves to some mighty uncomfortable moments in the air and to some heavy repair bills.

"A stitch in time. . . . . ."

Pilot's Report: FD-25

(*Continued from page 21*)

little FD-25 is a sweetheart to fly. If you can do a good job of flying a *Cub*, there's no problem at all with the low-winged *Defender*. Nearly 100 different pilots have flown the prototype model, N90802, and there isn't a scratch on it yet.

Check out? It's a single-seater, and the only check-out is to have the project engineer John Thorp lean over your shoulder and point out the starter, fuel selector, ignition switches, flap handle and trim tab. From there on out, you're strictly on your own.

There was something about history repeating itself in this flight. Just four and a half years ago on the same Whiteman's Air Park in the San Fernando Valley, John Thorp (now project engineer for Fletcher) furnished one of his two-place *SkySkooters* to be flown for a SKYWAYS' pilot report. That airplane was built for a peacetime market, but today's model is the extreme opposite.

From the cockpit, the *Defender* is completely conventional—until you get around to the gun sight, rocket selectors and salvo switches. Two 30-cal machine guns were mounted in the wings of N90802 with space available for a thousand rounds of ammunition for each gun. However, there was no ammunition aboard on this particular flight. Four zero-length rocket-launching rails are permanently fitted below each wing, and can fire either four 5-inch HVAR rockets, 32 two-and-one-half inch folding fin rockets or 40 2.75-inch rockets in groups of five. These same rocket rails stabilize a 40-gallon Napalm tank (also made by Fletcher) under each wing. Any combination of armament up to 650 pounds can be installed without topping the gross weight of 2500 pounds. If two fuel tanks were used in place of the Napalm carriers, the ferry-flight cruising range of the FD-25 would be well over 2400 miles.

Sounds like an explosive piece of fighting equipment—and it is. Anything that carries that much punch ought to be tricky to fly, but the *Defender* is a pilot's dream airplane.

The landing gear is fixed and conventional, yet you can see out over the prop hub in taxiing without having to swing the nose from side to side. "If we had used a tricycle gear, the wheels would have had to retract," explained John Thorp, "and we wanted to keep the airplane as simple to build, maintain and fly as possible."

The propeller is a fixed-pitch McCauley hooked to a Continental E-225 engine that produces 250-hp at the 3100 rpm red-line. This particular engine has a "hot-rod" cam and idles rough, but smooths out into a man-sized roar as soon as throttle is applied. Compression ratio is only 7-to-1 and the engine will operate well on 80 octane fuel.

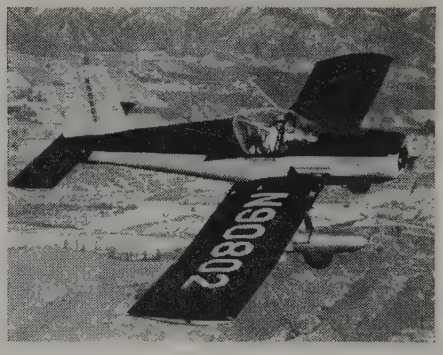
"It's all yours," Mr. Thorp said to me as he slid the canopy closed and stepped down off the wing. Half a dozen Fletcher engineers stepped back out of the prop blast, undisguised envy written all over their faces. No wonder, their little brain-child is a gold-plated treat for any pilot to fly.

Warm-up and pre-take-off checks amount to practically nothing. Both fuel tanks feed from an engine-driven pump. The mags check at about 1700. Trim tab neutral. Flaps either full up or down to the first 20° notch. Check the controls for full freedom and you're ready to go.

Just as soon as you start forward on that throttle, you're sure that this airplane is different from anything built for civilian consumption. The engine lets out a husky snarl (a headset will keep out most of the noise) and you have to feed in a lot of right rudder to keep the torque from pulling you off the runway. The thrust line of this engine installation is slanted 3° to the right and 5° down (like the *SkySkooter* and *Ercoupe*), but there is still plenty of torque at full throttle.

"Use full throttle for take-off and climb," the Project Engineer had advised before we left the ramp. "This engine has an enriching jet to keep the cylinder heads cool during climb, so just pour on the power and lock the throttle there."

Cooling is similar to the new *Twin-Bonanza*. Two large polished stainless steel exhaust stack, six inches in diameter, stick out each side of the cowling. A smaller exhaust stack goes part way aft in the center



NAPALM tanks under FD-25's wings knock about 10 mph off plane's cruising speed

of this larger stack. The jet thrust from the exhaust gases creates a venturi effect that sucks heated air out of the engine. To date, no overheating problems have developed.

The take-off run with a full load of 2500 pounds is only 500 feet. The *Defender* had only 1,850 pounds on this flight so we were off the ground in a hurry. The speed built up immediately to the recommended 100-mph best rate-of-climb. By then it was time to make the sharp left turn in the Whiteman Air Park pattern to keep from flying out over a crowded residential area. This was followed closely by a right turn out over the few clear fields remaining in the San Fernando Valley.

In looks, performance and flight characteristics, the FD-25 is similar to the recently popular Goodyear racers. It looks fast and handles fast. The added horsepower takes care of the added weight, and the *Defender* will outperform some of the Goodyear competitors.

A quick check of the engine instruments showed everything in the green, so I took time out to look back and see where the airport had gone. It looked small and far away. I wondered why until I glanced at the rate-of-climb—1,550 feet per minute, and I wasn't crowding it a bit.

Since this flight was made without a flight plan, I had to level off after only a little more than two minutes to remain below the 4,000-feet-above-terrain limit. In level flight, the nose goes way down and visibility is just about perfect. Since the pilot's eye level is even with the leading edge of the wing, downward visibility is not impaired as it is in some low-winged aircraft. The full bubble canopy gives the unobstructed rearward vision so necessary for tactical equipment.

This canopy is no accident. One Fletcher engineer commented, "You can't hit 'em if you can't see 'em."

Since this airplane was designed for close-in flight over hill-tops and around trees, it was to be expected that the rate-of-roll would be rapid. The plane takes a lot of rudder and not too much aileron to snap into a fast vertical turn. This type of control balance is deliberate so that less-experienced pilots won't get into trouble by kicking in too much rudder and winding up flat on their backs.

Accelerated (high-speed) stalls that would develop from violent maneuvering close to the ground are extremely docile. I racked the *Defender* up in a tight vertical turn and came right on back with the stick. The turn tightened until it appeared that the plane was pivoting on its wingtip and then a mild buffeting was felt in the stick. Just to see what would happen, I came all the way back to the stops with the stick. The airplane shook a little—like a lazy dog throwing water from his back—and rolled slowly back into level flight.

Later, John Thorp explained how this stability is acquired. The 19-foot 3-inch straight section of the wing has a NACA 652-416 low-drag laminar flow airfoil that stalls rather abruptly at 65 mph. The two outboard sections have an airfoil that is modified ahead of the wing spar so that they never do stall out. The ailerons are on these tips that sweep up 6°, and have full control at any speed. Actually, the stalling speed is that point (41 mph at full throttle) where the airplane sinks excessively, and the buffeting is caused by a loss of downwash from the center of the wing on the horizontal section of the tail.

The little FD-25 handled so nicely that it was a great temptation not to go through the full treatment of slow and snap rolls. However, it was someone else's airplane, and the only one yet completed, so we didn't. The plane will naturally withstand any normal aerobatics and is stressed through for 9 G's with a full load and 3.6 G's inverted. The red-line on the airspeed is 340 mph.

Cruising speed on 68 per cent power figures out at 150 mph. It will top over 190 without rockets or external Napalm tanks. It is at the other end of the airspeed, however, where the FD-25 really shows its best. With power off and the stick all the way back, the airplane will stall power-off at about 50 mph. If you sit there and hold the stick all the way back, it rocks up and down slowly, like Grandpa's front porch rocker, without the slightest tendency to drop a wing-tip. With full flaps, the motion is the same only the nose doesn't come up above the horizon.

The airplane will spin, but it takes more coaxing that a skeptical brunette, With full back stick and full rudder, the nose slides around the horizon for at least 90° before it begins to drop. Then the slightest forward motion of the stick and/or top rudder and the plane is back flying again. Out of steep

turns, the action is the same. With the stick held all the way back in a vertical turn and full bottom rudder kicked in, the nose started down slowly and the airplane immediately rolled back in a smooth dive when the back pressure was released.

In addition to a regular seat belt, the Fletcher has a shoulder harness hooked with an inertia lock reel to the top of the fuselage just back of the canopy bubble. Even in violent maneuvers, there is no tendency to slam against the side of the cockpit. There would be no reason to wear a crash helmet in this airplane.

The air was crowded with weekend traffic —airliners heading for nearby Burbank and Sunday pilots wheeling their puddle-jumpers out of town. The full-vision canopy on the Fletcher made it no problem to check-out the airplane even in this congested area without getting near any other planes.

A number of little things have made the Fletcher product lightweight and simple to build. Fuel gages, for instance, are the wire-on-a-ping-pong-ball type that stick up out of the top of each tank through a no-leak fitting. The throttle is a regular knob-on-a-rod common to most side-by-side aircraft. The ignition switch and starter arrangement is similar to the Stinson. The two 30-gallon fuel tanks are rubber cells in the wings and could be made self-sealing without modification. The seat slides forward and aft over a four-notch travel range to handle pilots of different sizes. Because of this travel, the rudder pedals are not adjustable.

With an eye toward possible material shortages, the Fletcher Brothers have built the FD-25 completely of magnesium, which is not as difficult to obtain as aluminum. Magnesium is two thirds as heavy and two thirds as strong as aluminum.

All the armament and explosive combinations for the *Defender* have been successfully demonstrated to the various military forces. The 40-gallon Napalm drop-tanks were originally mounted on the wing tips, but a recent modification put them between the two inboard rocket rails so that they may be dropped individually without greatly affecting the trim of the airplane.

No armor plate is installed on the airframe because of the plane's extreme maneuverability. The designers feel that this plane, hopping up over trees and hills to fire its weapons, will be down out of range in such a short time that it presents virtually no target.

Certainly, the Feltchers have been successful in designing a product that packs a hefty punch, yet is simple enough to fly so that a relatively inexperienced "aviator" or "flying infantryman" could direct this aerial rocket-launcher at the usual infantryman's targets—tanks, gun emplacements, convoys and troop concentrations—that he has been trained to spot. No expensively trained "professional pilot" would be needed for the *Defender*.

One landing proved the easy handling characteristics of the FD-25. From 4,000 feet, I cut the power and headed for the airport in a steep spiral let-down. The airspeed crawled up to 200 and the ground came up in a hurry. At pattern altitude, I let the little plane decelerate to the 100-mph flaps-down speed. Pull up with your left hand on the long flap handle and the nose drops—so does your forward speed as the flaps go down a full 40°. Since the Continental engine has a fuel-injection system, there is no carb heat to worry about even though the plane has an alternate source air intake for extreme icing conditions. No landing gear to check, no prop pitch to adjust, no check list to complete—just close the throttle, dump the flaps and head for the runway.

A conservative approach speed is 75 mph. I came in a little high and hot on the first landing over the tangled maze of telephone wires and poles that clutter the approach end of Whiteman's Air Park. If your pattern is properly executed, you come in beside and below the top of the last telephone pole. With about 20 mph too much speed, I floated a hundred feet down the runway as I flared out for a landing, but the big flaps quickly dissipated the speed and the plane landed slightly tail-wheel first with the stick all the way back. The wheel tread (8 feet 1¼ inches) combined with smooth Goodrich brakes brought the FD-25 to a quick, easy stop. There's no stretching your neck to see if anyone is landing behind you before taxiing off the runway. Just turn around—and look back over the tail.

For SKYWAYS photographic purposes, two empty 40-gallon Napalm tanks were installed below the wings and the Fletcher company pilot Roy Cusick flew the FD-25. For an air-to-air photo, he slowed the *Defender* down to the 60-mph climbing speed of Cusick's own Aeronca *Champion*.

Adding these two big aluminum tanks gave me the excuse to fly the *Defender* again. This airplane is so much fun to fly that any excuse would do. Performance-wise, the addition of these big tanks is not noticeable on take-off or climb. It does cut about 10 mph off at cruising speed. Even in a dive toward the traffic pattern at nearly 200 mph, there was no trace of vibration from the novel mount that utilizes the regular rocket-launching rails

A two-place version, the FD-25-A, will be flying by the time this appears in print. It is identical with the prototype single-place model except for the addition of 10 inches in the fuselage to place a second full-sized seat. This multi-purpose plane is designed as a primary, advanced or instrument trainer, ordnance trainer or laison spotter plane. Fletcher Aircraft has purchased the Rosemead Airport near Pasadena and plans to manufacture these two planes there.

Even in moderate quantities, the designers feel that this plane can be built for less than 1,000 man-hours and at a cost comparable with current liaison planes. The original prototype and the subsequent two-place version have been designed and built without a military subsidy.

From a time, material and cost standpoint, the Fletcher Brothers feel that a dozen *Defenders* can be put in the air for the cost of one tactical jet aircraft. They emphasize that this plane would not take the place of anything in the air today, but that it would efficiently add to the striking power of any military organization.

The single-place plane I flew is carefully designed to do a specific job. While N90802 was the prototype model, the plane was completely finished and, unlike many first models, there were no incomplete installations. The logistic merits of the *Defender* are up to the High Brass in Washington, but from one pilot's viewpoint, it is a mighty fine piece of flying machinery. Yes, and it's designed for today's unsettled market.

TIME IS VITAL
decide
now
AVIATION
CAREER

Essential industry needs trained men and needs them badly—NOW!

AERONAUTICAL ENGINEERING
MASTER AVIATION MECHANIC
JET ENGINE MECHANIC

MAXIMUM TRAINING IN MINIMUM TIME

Upon graduation you can step right into an Aviation job without break-in —and at TOP PAY...CAL-AERO GRADUATES ARE IN DEMAND.

RECOMMENDATIONS

10,000 civilian graduates — 26,000 pilots and 8500 technicians trained for U. S. Military Air Forces, Engineering graduates eligible for OFFICER CANDIDATE, AIR FORCE & NAVAL AVIATION CADETS, Approvals — E.C.P.D. Nat'l. Council of Tech. Schools, Calif. State Bd. of Education, C.A.A., listed U. S. Office of Education, U. S. Immigration Service, Aircraft Industry. NOW AGAIN, training technicians for the U. S. Air Force.

What better recommendation could a school have?

MAIL COUPON TODAY!

CAL-AERO TECHNICAL INSTITUTE
GRAND CENTRAL AIR TERMINAL
GLENDALE 1, CALIFORNIA

Send full information and free catalog, immediately
☐ AERONAUTICAL ENGINEERING
☐ MASTER AVIATION MECHANIC
☐ JET ENGINE MECHANIC
HOME STUDY COURSES
☐ Aeronautical Drafting ☐ Aircraft Blueprint Reading
☐ Stress Analysis and Design

NAME AGE
ADDRESS
CITY ZONE STATE
High School Attended Graduated Yes☐ No☐
S-2 Check one: ☐ Veteran ☐ Non-Veteran

U OF I
LIBRARY

Gen. "Ike's" Eagle

(*Continued from page 27*)

Having flown VIP's in and out of Washington for almost seven years with various combinations of the available crew members, every member of the SAM squadron was well known to him. It was a simple matter for him to come up with what he believes is the best air crew in the business today.

After the initial tour of the NATO countries was finished, it followed quite in order that Major Draper and his gang would remain to fly General Eisenhower on his many official trips. These trips have taken them into every major airport in Free Europe, and made them the best-known crew in the NATO nations.

The men who make up the crew—there are nine of them for the long trips—are vets in the VIP flying business. They come from as far west as Utah, as far north as Minnesota, as far south as Florida, and as far east as New York.

With Draper at the top of the sheet as Airplane Commander, the "Columbine" manifest which has graced Operations offices all over Europe reads something like this:

First Pilot: Major Orlo V. Harkness, 31, Miami, Fla.

Co-Pilot: Capt. Keith L. Christiansen, 26, Salt Lake City, Utah.

Navigator: Major Vincent Puglisi, 31, Brooklyn, N. Y.

Crew Chief: T/Sgt. John R. McClane, Scranton, Pa., and Lawrence, Mass.

Radio Operator: T/Sgt. Daren A. Linnel, 28, Duluth, Minn.

Flight Engineer: T/Sgt. John J. Higgins, Jr., 30, Abington, Penna.

Steward: M/Sgt. Dwight Snider, 29, Columbus, Ohio.

Flight Attendant: T/Sgt. Jack Woodward, 29, Buffalo, N. Y.

Like the famous "three-headed monsters" of the Air Force B-45 crews, most of the "Columbine's" men double-in-brass on one or more jobs when necessary. Major Puglisi, the navigator, often takes over the radio mike and receives control tower instruction in either French, German, Spanish, Italian, or English, whichever the occasion demands. Sgt. Higgins and Sgt. McClane take turns at the flight engineer control panels. Sgts. Woodward and Snider spell each other in the cooking and serving of the many in-flight meals prepared aboard the ship. The three pilots are also excellent navigators.

The crew swarms over the big ship during pre-flight inspections and during the post-flight bedding down wherever the business of General "Ike" indicates they will RON.

Draper has been flying since 1939, combining both commercial and military experience in his 12-year career. Prior to Pearl Harbor, he was in Miami, Fla., as an instrument pilot instructor for Pan American Airways. He is a little hazy about the miles he has flown and admits he hasn't checked up lately on the number of hours he has accumulated. He is sure of one thing though —he hasn't had a single flying accident in his life. He also is sure of the 168 ocean crossings he has logged. He and his crew average about 50 hours per month on this assignment. That doesn't mean that they are not flying almost daily. It just doesn't take the C-121 long to get from one country to the other on the crowded European map.

Currently, the Drapers are calling Paris home. Homecomings to Orly are made doubly happy for Bill, because his wife Billie, daughter Mary Ann, 4, and son Jimmie, 1½, are invariably at the field to greet him.

Incidentally, flying is not a taboo subject in the Draper home as it is in some Air Force homes. Bill can talk flying to his heart's content and find a willing and understanding listener in Mrs. Draper. She has flying in her blood, too, and has logged a goodly number of hours in her own right as an airline hostess.

In fact, the pretty Selma, Ala., brunette who personifies the air hostess' combination of beauty and brains, was flying out of Miami for Pan American when the couple met. Somewhere along the line, Bill, as an instructor, promoted her from the rear compartment of a *Stratocruiser* to the co-pilot spot in the Draper household.

In spite of the frequent absences of her husband, she says, "We love this assignment and really enjoy living in Paris."

The kids can spot the "Columbine" with radar accuracy and they fill the air with cries of "Here comes Daddy!" almost before Draper gets his landing instructions from the control tower. They are quite popular around Orly, especially with the corps of drivers and orderlies who meet General "Ike" and his party each time he returns. The Draper kids get in many a good romp with them while they are sweating out the Old Man at the parking ramp.

Necessity dictates that many of General Eisenhower's important conferences are held while flying from one place to another, and in his packed schedule much of the planning must be carried out while in flight. Many of his meals are taken more than a mile above the earth.

So, in addition to seeing that the "Columbine" gets swiftly and safely to its destination, Major Draper and his crew are responsible for the smooth operation of its combination "office—dining room—parlor—bedroom" interior.

The desks must be in order, the galley well stocked, cabin temperatures comfortable, and on long flights the berths made up. The General's guests are made as comfortable as if they were in their own homes. In General "Ike's" stateroom there is also a map which charts the course, and which is kept up to the minute during the flight.

Do they succeed in all these things?

The answer is in the seven words heard at the end of each flight—

"Thanks, Bill. Thanks for a wonderful ride."

PICTURE CREDITS

Pages 8—Lockheed, Northrop; 10, 11, 12—Levy; 13—US Navy; 14, 15—Downie; 16, 17—Ryan Aeronautical, US Army; 18, 19—Joseph; 20, 21—Downie; 22, 23—Continental Motors; 24—Piper Aircraft; 26, 27—US Air Force; 30, 31—Soidami, Levy; 32, 33—Levy; 34, 35—Aerodex, Inc.; 36—AiResearch, Levy, Consolidated Vultee; 38—British Info; 40—Levy; 41—Northrop; 42—Grumman; 48—Beech; 50—Downie; 54—United Airlines; 62, 63, 64—CAA.

Fly the Map

(*Continued from page 25*)

then turned northwest and passed over Harrisburg, straight up to Phillipsburg? By this route, over three quarters of your flying is being done over level country. Yes, it's longer, but what are you going to do with the half hour or so that you gain by being a daredevil and worrying all the time you are sailing along over the quarries? If you really *like* to fly, the extra time in the air ought to be an added enjoyment!

Between Teterboro and Allentown you need not worry about following an airway. New Jersey is getting so built up you couldn't be lost for very long no matter *where* you landed, and it's only a bare 100 miles anyhow. So lay off a straight pencil line on the map between Teterboro and Allentown and mark it with a red pip every 10 miles. Now, with your transparent protractor, measure the angle that this line crosses the map. It's 280° on the nose. You'll notice that the twisty dotted line of magnetic variation in this area is 10° West. You *add* westerly variation. So add the 10 to the 280 and get 290.

You have two other corrections to make. One is for wind, the other is for compass error. Now, very soon, you'll see why I suggest you pick a bright clear day for your first serious cross-country. I bought an E6B computer and spent a long time figuring out how to use it. To get wind correction you call the tower for the direction and speed of the wind, feed them into the computer, and come out with a neat, exact figure.

But somehow that neat exact figure never works for me, in the air. Maybe it works in heavy planes. But it sure as heck doesn't work in the Mooney. Here's what I actually do on a cross-country, and I *know* it works. I take a look at the wind sock and see which way the wind is blowing—and then I take a healthy guess as to how hard. I don't get myself messed up with a lot of mechanical rules, like "add wind right," etc. I know from common sense that the wind is going to drift my plane unless I crab into it. So I crab into it, regardless of which way it is coming. Let's suppose that the wind on our Teterboro-Allentown leg is coming at 15 mph from the north. That means it's trying to blow the Mooney south. So, instead of the 290° we figured out a minute ago, we have to turn to a more northerly heading. Just for trial and error, let's pick 300° as our direction.

Now I take a look at my compass deviation card. The card says my compass is perfect on a northerly heading. "For N, stear N," it says. This was probably true when the plane left the factory, but in the meantime, I have added a sensitive altimeter and a turn-and-bank indicator and I have had the compass fiddled with four or five times by guys who said they had it fixed perfectly. But I've caught it doing some pretty silly things, and I don't quite trust it. I have to keep it honest. On every new cross-country heading, I test it out against the course line on the map.

Let's do that now. Let's assume that compass is honest, but check it as we fly. I get a clearance from the Teterboro tower, take off on runway 1, and climb out to the northward. But I do not leave the field at once. All around the Teterboro field there are houses and factories. You cannot land on them very handily. So I use my first cross-country rule:

I climb to altitude while circling the field at Teterboro, so if anything goes wrong, I can drop safely back into it. When I have reached 3500 feet over the field I put the Mooney on the 300° heading I figured out, check my watch to be 10:00 in the morning, put my map on my knee, and start out.

I do not use a computer to figure my speed. I do not care what my speed is. All I want to know is how long it takes me to go from one check point to another.

I look at my map as I take leave of Teterboro. The first check point will appear after I have passed over the yellow bulge on the map that attaches itself to the larger yellow mass that represents the city of Newark. Off to the right, about two miles from this point, is the big Caldwell-Wright airport. I drone over Hasbrouck Heights, over a snaky river, clear the edge of Newark and the brown ridges that appear on the map. I look for the Caldwell-Wright airport, and finally I see it—six miles to the north. I check my watch at once. It says 10:06. I know I'm very close to 10 miles out from Teterboro, and that it took me six minutes. That's all I need to know about *that.*

But I'm off course. The Caldwell-Wright airport should have been only two miles to the right. It's six. Either my wind correction is wrong, or my compass is wrong, or they are both a wee bit wacky. I'm too far south. So I change my 300° heading to 310°, and start looking for my next check point.

New Jersey is awfully confusing in here. There seem to be a million little towns all running into each other, and there are so many highways and railroad tracks that pretty soon you get utterly balled up unless you keep on course.

So I steer 310°. I know that in six minutes—at 10:12 to be exact—I ought to be passing over the Morristown airfield, a 4,000-foot hard-surfaced field that can't be missed on a day like this if I'm even close to it.

At 10:08 I pick up the field dead ahead. At 10:12 I pass over it and see the town of Morristown coming up under the Mooney's nose. But the town is easing in at slightly the wrong angle. I'm flying across it in too much of a northerly direction. That means I overcorrected when I picked 310°.

Going over Morristown, I shift back to 305° and start looking for my next checkpoint, a town called Mendham. At 10:18 I ought to pass directly over Mendham.

At 10:18 I *do* pass directly over Mendham. Now I can relax, and follow that 305° compass heading. I don't know what ingredients went into that heading and I don't care. But I do know with dead certainty that if I follow that heading I'll hit Allentown airfield.

I look at the line on the chart. There are five red pips on the line between Mendham and Allentown. I am making each 10-mile segment in six minutes. So I don't need a computer to figure out when I'll get there. I'll get there in around 30 minutes.

This routine I've just outlined is guaranteed foolproof. You can use it in any section of the country, provided you have sufficient visibility, with perfect certainty that you'll get where you are going, unless you dope off and lose half a dozen check points.

Now let's broad jump along the course to Phillipsburg and pick up any extra tips that might be useful. First, I find it helps to jot down the magnetic heading on your sectional chart. Pick a clean spot, uncluttered by roads or towns, fairly close to the course line. But don't stop there. Figure out also, the heading you'll use coming *back* along that line, and jot it down, too. If a thunderstorm looms ahead, you'll want to make a 180° turn right now! You'll be surprised how hard it is to add or subtract 180° from a given heading when you are flying into lousy weather! Better to have it down *correctly,* right on the map!

Now a word about mountains, which you'll pass over when you leave Harrisburg and follow the airway to Phillipsburg. You can't dodge the mountains on this leg of the trip, but you can fly high enough to glide safely down into one of the many valleys. The mountains are pretty high in some spots—as much as 7500 feet—and that's another reason why you ought to pick a good day for your first big X-C. On poor days you can't get up 7500 feet without being buried in the soup.

I personally would not try to fly cross-country without radio in anything less than 10-mile visibility. I know that's higher than CAA minimums by a long shot, but anything else makes me jittery and the flight isn't any fun anymore. My friend with 800 hours almost lost his life due to icing. He was over the Pennsylvania mountains, flying under an overcast. The air was clear. There was snow on the ground, but the temperature was hovering around freezing. Suddenly he detected a fine mist around him. In a matter of seconds the *Pacer's* windshield was coated with clear ice. He opened the side window and stuck his head out, looking for an emergency field. Suddenly the stall-warning horn began to blow. With a stab of panic he noted that he was well above a normal stall speed, and advanced throttle. A small field showed up in the wooded hills under him and he circled downward for it. The airspeed was 80 and the horn was blowing again. He opened the throttle wide and came over the trees at 110. He dived it down, flared it and set it on at 100, with the horn still blowing. The plane never even bounced. It stayed down like a Mack truck. After he had groundlooped the plane and torn off a wingtip, he stepped out safely. The wings and the forward part of the fuselage looked like a giant-sized *Pacer* made of glass. He had picked up more than 800 pounds of ice in less than two minutes!

My friend was lucky and cool-headed. A few more minutes in the air would have stalled him out at full throttle and washed him out for keeps. Ice on aircraft is murder. To avoid it, pay heed to this: *Never fly under an overcast in winter with temperatures near or somewhat below freezing.*

What happens is this. A temperature inversion has taken place. In words of one syllable—the air in the clouds is warmer than the air you are flying through under the clouds. Rain forms in the warmer clouds, falls down and hits your cold aircraft and freezes to it. The very motion of the plane itself aids this freezing. The only thing to do if this happens to you is to get down as fast as is humanly possible!

To go back, for a moment, to the beginning. If you haven't the money for radio, a sectional map and a compass will take you there every time in good weather. If you fly for business and have to go through marginal weather, *radio is a must.* But don't forget, there's no substitute for simple old-fashioned map flying if the radio goes out or the range gets screwed up.

GENUINE

NAVY INTERMEDIATE PILOT JACKET

Brand new. Genuine dark brown Goatskin leather. Bi-swing back, two patch pockets, one inside snap pocket, Mouton fur collar, Celanese lined, 100% wool cuffs and waist band. U.S.N. issue.

FINEST JACKET MADE
SIZES 34 TO 46—$35.00
State Size Wanted

FLYING EQUIPMENT SALES CO.
Dept. S
1639-45 Wolfram St. Chicago 13, Ill.

PORTABLE GARAGE

$10.95 (Extra Heavy Gauge) $8.95 (Heavy Gauge)

Flexton Awarded Good Housekeeping Seal

USE IT ANYWHERE!

• Goes wherever your car goes • Folds compactly • Keeps rain, snow, dust, salt air, sun or sleet away • Will withshand Extreme cold without cracking and protects your car's finish • Perfect for storage of Cars, Furniture, Machinery Equipment • Durably constructed of clear transparent vinyl plastic that is long wearing and tough • Nylon threads and grommets for extra security • Spring-tite elasticized bottom, holds securely in all kinds of weather • Fits all makes and models • Direct from manufacturer • Enclose check or money order, or sent C.O.D. 10 Day Money Back Guarantee.

MARDO SALES CORP., Dept. 125
480 Lexington Ave. New York 17, N. Y.

UNLIMITED OPPORTUNITIES IN AERONAUTICAL ENGINEERING
DEGREE IN 27 MONTHS

Accelerated Course. Personalized, practical instruction. Wind tunnel, structural and dynamometer testing included. Bachelor of Science Degree courses also in Mech., Civil, Elect., Chem., Radio (Telev.) Engineering; Bus. Adm., Acct. Beautiful campus. Well equipped, modern buildings and labs. World-wide enrollment. Established 1884. Prep. courses. Low cost. Placement service. Growing shortage of engineers. Prepare now in shortest possible time for the opportunities ahead. Enter Sept., Jan., March, June. Write for catalog.

TRI-STATE COLLEGE
822 College Ave. ANGOLA, INDIANA

LOW TIME D18S LATE MODEL
Executive interior—Corporation owned
Immediate delivery
Sacrifice at $42,500
REMMERT-WERNER, Inc.
LAMBERT FIELD ST. LOUIS 21, MO.
CABANY 5425

Exec-Plane Schedules

(Continued from page 30)

Estelle, head of the Aviation Division of Esso Shipping Company, transportation affiliate of Standard Oil Company (New Jersey), expresses the plane's purpose more forcefully. "Never," he said, "have business executives been under such teriffic pressure as they are today. Meetings are sceduled, hours apart, in cities separated by hundreds of miles. Time is at a premium. An executive today *must* have mobility.

"We have four planes out at Newark now —two DC-3's, a *Lodestar* and a Twin-Beech. And I often think perhaps their greatest contribution is that of reducing the pressure on our top men. Simplifying their transportation problems is one way we can help them guard their health against the heavy demands of business."

Col. Estelle, himself a pilot since World War I, apparently spends more time at the stick than at his desk, and looks as if he likes it that way.

Esso's four planes fly Jersey Standard men "everywhere the oil business takes them." This pretty well covers continental United States, with occasional flights to Buenos Aires or Rio de Janeiro. In 1950, with three planes, Esso pilots flew the equivalent of 13 times around the world. This broke down to some 830 hours for the DC-3, 700 for the *Lodestar,* and 400 for the Beechcraft. Flying time in 1951 will probably be higher.

To arrange and coordinate all flights, Esso keeps a dispatcher on duty 24 hours a day. When a secretary notifies him of her boss' travel plans, he sets up the trip on the books and notifies the crew. He makes rail reservations as an alternate, in case the weather goes completely bad. He checks to see whether the executive is arranging his own transportation from home to the airport. If he isn't, the dispatcher arranges it for him.

Esso has a full crew for each plane plus one spare pilot. Hiring standards are exceptionally stiff. "We operate on a high safety margin in equipment, too," said the Colonel. "All planes have ILS plus Zero Reader. Our new DC-3, I believe, is the first corporate aircraft of its type to have its auxiliary tanks in the outboard wing sections—no more gas in the fuselage. The airplane is equipped with the new 'CB' fire-extinguishing system using Bromochloromethane, with outlets in all power zones and the wheel wells. The total capacity of the system is 500 per cent of that originally required for similar protection. It's a Walter Kidde Co. development. On the comfort side, all the chairs swivel on tracks for adjustable spacing. And there's hot *and* cold running water—another first, I think."

Quite a different operation is run by Frank Hotaling, Traffic Manager for the Kudner Agency, Inc., large advertising firm and one of a very few advertising agencies to own aircraft. Among the companies your reporter contacted, Kudner seems to have the most fully developed coordination of *all* travel. Hotaling came to the firm about a year ago from one of the major airline companies, where he planned itineraries. This experience he has turned to good account for Kudner, where airline and railroad travel as well as request for use of the agency's luxuriously appointed DC-3, are channeled through his office. This has resulted in economy of operation as well as maximum efficiency and convenience for the whole agency, from President J. H. S. Ellis through the various executives and staffers who travel frequently.

The agency's volume of travel is more than enough to keep a DC-3 busy. Indeed, on any given day, Hotaling said, there would probably be at least four men heading for various points in the midwest, whether the plane was going or coming.

There is general agreement at Kudner that the plane, purchased over a year ago, has enabled the agency to give more and better service to clients. The shakedown period is over, Hotaling says, the airplane is a necessary tool of business, not a toy.

Kudner's three largest clients, General Motors in Detroit, Buick in Flint, and Goodyear in Akron, account for the bulk of the flights. Hotaling makes a definite effort to combine trips so that a minimum of five passengers can be accommodated. This, he figures, is the point at which the airplane begins to pay off in dollars-and-cents terms. Of course, any absolute rule on this point would defeat the original purpose: to get key men to key places when they need to be there.

Such a system is dependent on the Traffic Manager's assurance of cooperation on all levels. Occasional snags may arise when an individual neglects to apprise the TM of his plans sufficiently in advance. Or several persons, all desirous of flying in the same general direction, may have trouble agreeing on a departure time, or a date for return. These are the TM's headaches. Hotaling's success in dealing with these problems is indicated by a marked general increase of interest in air travel at the agency. Many executives who seldom or never flew before the DC-3 was acquired, now fly by airline if the company plane is not available.

Another company, General Electric, has two planes for transportation purposes—a DC-3 based at Schenectady, where the company's general offices are located, and a B-23 at Newark, for the use of the men in the executive offices in New York City. There are also at Schenectady a couple of *Navions* which are used for testing equipment and, occasionally, for comparatively short-haul emergency trips.

With GE, as with most plane-owning companies, the paramount consideration is the efficient and convenient transportation of the chief executives, beginning, in this case, with President Ralph J. Cordiner and Chairman of the Board Philip D. Reed. But there's no

KNOTTY PROBLEM has United Air Lines' Captains Paul Fidler *(left)* and J. E. Cross busy determining the difference between knots and miles-per-hour as the airline prepares to switch from statute miles to nautical miles by July 1, 1952. This conversion is part of an international standardization program affecting all military and civil aviation. But if you still like mph, you can convert knots to statute mph by multiplying knots figure by 1.152. Roughly increase speed reported in knots by 15 percent for mph

conflict with economy. As one executive put it: "As we see it, the real economy is in terms of our executives' time."

The greatest number of flights are made to the various General Electric plant locations, most of them within the industrial east, but there are trips, too, to such points as Hanford, Washington, where GE is cooperating with the U. S. Government on atomic projects.

Each plane is scheduled by its home office. President Cordiner's office, which controls the movements of the B-23, is kept informed of the DC-3's itinerary, and travel plans are coordinated when it is convenient.

General Electric men find that plane ownership has given them a valuable element of flexibility and saved countless hours of travel. For instance, said one spokesman, "We sometimes have trips to Pittsfield, Massachusetts. The closest we can get by airline is Albany. With its own plane GE can land at the Pittsfield Airport, almost at the doorstep of the Pittsfield plant."

GE has been a plane owner since soon after World War II when the company purchased a Lockheed *Lodestar*. This was replaced by the B-23 in 1948, and the DC-3 was added in September, 1950. The concept of the DC-3 as their "minimum" airplane was established, informally, by Defense Mobilizer Charles E. Wilson before he left the GE presidency to take up his federal duties, and the idea has been endorsed by present executives. They speak highly of the B-23, which they consider the safest and fastest of its type. As converted for GE, it carries nine passengers plus pilot, co-pilot and mechanic. In addition to the DC-3's pilot and co-pilot, there is a full maintenance crew at its Schenectady base. The B-23 logs about 35 hours a month, the DC-3 about 40. Both figures are increasing steadily.

President Cordiner and Chairman Reed, by company rule, do not fly together, whether by airline or their own plane; nor do any senior officers above the number of four. Staff members and customers sometimes make up part of the passenger list. Conflicts rarely arise; it is seldom, for instance, that Mr. Cordiner and Mr. Reed are required to travel simultaneously.

Howard L. Maurhoff, assistant treasurer of National Dairy Products Corporation, describes himself as "liaison between the pilots and the brass." All the company's top executives, he said, use the firm's DC-3, which logged about 450 hours in 1951. In the month of October alone, the plane made 24 complete trips.

Mr. Maurhoff described the DC-3 as "worth its weight in gold. Our top people," he said, "hop into the plane and go to places where it just wouldn't be practical for them to travel any other way. We make a number of trips into the midwest and south where we have various operating divisions. Of course, we use the airlines a great deal, too. In fact, our airline bill is 10 times what it used to be before we bought our own plane. But having it, we can travel on our own schedule. And when the men have completed their business, the plane is waiting and ready to carry them at their convenience to the next stop. Our officers are definitely air enthusiasts. They would be at a loss without a plane now. But where the airlines can give use faster service, we use them."

An aviation enthusiast himself, Howard Maurhoff is treasurer and director of the Corporation Aircraft Owners Association.

National Dairy's president L. A. Van Bomel and executive vice president E. E. Stewart are the most frequent users of the company plane. Others, when their duties require it, usually clear with one of these two officers or with Mr. Maurhoff, for use of the plane.

One of the company's principal divisions, the Kraft Foods Co. of Chicago, owns and operates a Beech D18. Other subsidiaries, which cannot presently utilize a full-time plane, sometimes request and get the use of the parent company's DC-3 for periods of a week or two at a time. During this period, they usually make several trips. Southern Dairies, Inc., for instance, recently used the plane for a round-robin which took officials from headquarters in Washington, D. C., to Key West, Florida, New Orleans, Louisiana, and back.

Flight records are as important to corporate-aircraft operators as they are to the scheduled airlines. These records kept by corporate owners are simple, but entirely adequate. A typical example is the form set up by Mr. Maurhoff for National Dairy, showing point of departure, destination, time off and time down, hours flown, and passenger list. The remarks column sometimes records the names of any "VIP" guest passengers, or the fact that a luncheon was served aboard. This was adapted, Mr. Maurhoff said, from a blank he had seen used by another firm. Mr. Maurhoff also maintains individual logs for some of the executives. President Van Bomel's duties, he recalled, took him on flights that totaled about 20,000 miles in 1950. For the purpose of carrying running totals, etc., Mr. Maurhoff uses what looked to your reporter like double-entry bookkeeping blanks. Another firm keeps this important information in an ordinary ruled shorthand pad.

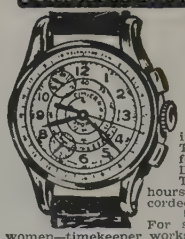
Most of the officials responsible for scheduling corporate aircraft like to have a week's notice to plan a trip, but two said they could and many times had gotten their aircraft off the ground on only an hour's notice —almost as soon as the passengers could arrive at the airport. National Dairy's DC-3, incidentally, is based at Bridgeport, Connecticut, and usually picks up passengers from New York at LaGuardia or Westchester, just a few minutes flight time away from home base.

Only two of the four companies employ persons with specific aviation experience to handle scheduling: Esso, with its fleet of four planes, and Kudner, where it has been found desirable to coordinate all travel at one desk. Scheduling officers at GE and National Dairy are executives of their companies who have had no specialized aviation background.

Plane ownership tends to *supplement* these firms' use of the airlines rather than to replace it. In fact, as we have seen in so many cases, it actually stimulates use of the airlines by familiarizing executives with the convenience and comfort of flying.

The executive aircraft has indeed made itself indispensable. Small fields and odd hours, round-robin trips and overnight stops with no wait in the morning—the company plane overcomes all these problems. It carries a whole team of executives as cheaply as one. These firms have not merely bought airplanes—they have integrated a new dimension in travel—flexibility.

CHRONOGRAPH WRIST WATCH



Lifetime Guarantee
(EXCLUSIVE OF PARTS)
3 DIALS
5 HANDS
2 BUTTONS
$7.90 Plus Tax

Multi-purpose watch that measures distance, speed, time, moving objects. Used as Stop Watch or Timepiece. Has Sweep-Second Hand for full 60 Second count. Second Dial records up to 45 minutes. Third Dial then records up to 6 hours. Seconds—Minutes—Hours, all recorded automatically.

INDEPENDENT MOVEMENTS — For sportsmen, professional men and women—timekeeper works when other hands and dials are stopped—separate movements permit dual use at same time.

RUGGED CONSTRUCTION
Precision workmanship and shock resistant, features are added to enhance the value of this watch. Sold everywhere for as high as $17.00. Our low introductory price is only $7.90 plus 10% tax. (Total $8.69.) Send check or money order and we prepay postage. Or sent C.O.D. plus charges.

MARDO SALES CORP., 480 Lexington Av., Dept. 126, New York 17, N. Y.

FOR BIG MEN ONLY!

SIZES 10 to 16 WIDTHS AAA to EEE

We SPECIALIZE in large sizes only —sizes 10 to 16; widths AAA to EEE. Loungers; Nylon Mesh; Dress Oxfords; Moccasins; High and Low Work Shoes; Slippers; Rubbers; Overshoes; Sox. Enjoy the finest in fit, comfort, style at amazingly low cost. Sold by mail only. Write for FREE Style Book *TODAY!*

KING-SIZE, Inc., 853, Brockton, Mass.

Join the
CRUSADE
for
FREEDOM
and Help Truth
Fight Communism

ENGINEERING DEGREE IN 27 MONTHS

INDIANA TECHNICAL COLLEGE

ENGINEERING: B. S. DEGREE IN 27 MONTHS. Aeronautical, Chemical, Civil, Electrical, Mechanical and Radio Engineering (inc. television). Drafting, 1-yr. Gov't approved for G.I.'s. Low rate. Earn board. Large industrial center. Students from 48 states, 21 countries. Demand for graduates. Enter March, June, September, December. Write for catalog. 222 E. Washington Blvd., Fort Wayne 2, Indiana.

Dilbert

(*Continued from page 28*)

wind stops? Of course, this is an "iffy" problem, but it is the sort of interesting thing that comes up in hangar bull sessions.

This artificial situation can only be created in a wind tunnel; winds don't stop instantaneously, they die down. Just for fun, imagine a giant tunnel with the fan blowing wind down the 5,000-foot runway at 40 mph. In front of the fan is a guillotine-like door which can be dropped to cut off the flow of air in an instant. As the plane comes over the end of the runway at 50 feet with 80 mph indicated airspeed, the door drops and cuts off the 40-mile wind.

The plane immediately loses the lift imparted by that airflow and, since it is now 30 miles below its 70 mph stalling speed, *it drops like a rock.* If it is unstable, it will fall off in a spin, despite the most expert piloting. If the plane is stable, the pilot may hold the wings level and, with the stick all the way back, get away with a hard landing —about enough to drive the oleo struts up through the wings.

During this short interval, the pilot is too startled and busy to check his airspeed indicator. It wouldn't help him anyway, for these instruments measure a difference in pressures, and the lag in changing the pressure in the lines would cause an erroneous reading. A *perfect* airspeed indicator would show only 40 mph the instant the wind ceased.

Recommendation: Please don't try to disprove these findings by actual test. If you run into such a condition, go around again.

Pilot-Caused Engine Failures—These things occur by the gross—gross negligence, that is. Here are a couple recent examples:

Case 1. After warming up the engine, the pilot taxied approximately 6,000 feet to take-off position at 850 rpm. After testing his mags at 1600 rpm, he started his take-off. Shortly after becoming airborne, the engine began to lose power necessitating a forced landing in rough terrain beyond the end of the field. Very rough.

Of course, we all know the errors here, but since they are made so often, let's spell them out. Idling or taxiing for long periods at low rpm without periodically blowing out your engine is a sure way of fouling it. As a rule, testing the mags on a high-power engine at 1600 will not reveal this condition. It takes about 1800 for a short period, followed by turn-up to full power as a final check. Besides all this, you should be particularly alert for a drop in power during every take-off run.

Case 2. This pilot was practicing stalls at 500 feet. After having had enough of this, he executed several slow rolls, the last of which was considerably prolonged. A few minutes later, when taking off after a practice landing, the engine failed completely. Following the subsequent forced landing, both the pilot and the airplane were sent for a major overhaul.

This case isn't so common, but it can—and will—happen to you if you fly inverted long enough to allow oil pressure to drop excessively, thus allowing the engine bearings to be wiped clean.

Yes, I know, some engines will maintain oil pressure in any position. But be darn sure yours is of this kind before you do those *slow* rolls.

Flying Pharmacists

(*Continued from page 33*)

non-scheduled airline and a flying school in which he specialized in instrument training. "He taught a lot of the boys at Eastern Air Lines what they know about instruments," says co-pilot Miller.

The two pilots respect and like each other, and the way they get along together is typical of the whole Squibb operation. They work hand in hand with their mechanic, Al Nelson, to keep Squibb's flight operation at top efficiency. When it's time to polish the DC-3, all three of them get out on the ramp and brighten it up with equal parts of Noxon and elbow grease.

Rintoul and Miller have even devised a check list for take-offs and landings so that they can check each other. The list has been stamped on a metal plate fastened to the cockpit ceiling. It's in two columns, one for take-off and one for landing, with a set of long-armed toggle switches anchored between them so that the switch arms can cover the items on either list. Then, at take-off time, whenever the pilot checks on item—say, "Fuel tanks full"—he flips the toggle switch over to cover that item. After he's checked the next point, "Cross Feed and Trim," he flips over the next toggle switch to cover those words. And so on down the list with both pilot and co-pilot knowing at all times, regardless of interruptions, what items have been checked.

"No fumbling with a check-off card," says Rintoul, "and no wondering whether you've checked a certain item or not. If you've checked it, it's already covered by the arm of the switch."

As the items on the take-off list are covered up, landing items are exposed one by one so that the landing check list is ready long before the plane is in the traffic circle.

Such caution is typical of the Squibb operation. Miller says, "We're a couple of old ladies in the cockpit. Even Al, our mechanic, helps us when we're entering traffic and lowering the gear. I always look out my window and say, 'Got a wheel.' John checks his and says, 'Got a wheel,' and then Al pops his head in. He can see the wheels better from the cabin and if everything's all right, he says, 'Locking pins in.'"

There's even a place on the flight log for Rintoul to check the landing gear pins. This flight log, designed by Miller, gives "From," "To," "Distance," "Estimated Time," "Estimated Time Over," "Actual Time Over," and "Ground Speed," as well as a dozen other items for navigation, estimation of fuel consumption, etc. Rintoul and Miller have kept every log and now use them as accurate records for the home office.

The Squibb exec-plane operation is efficient—but it's not plush. The cabin, of normal DC-3 size since no structural changes were made at the time of conversion, is tastefully quiet in pale green from floor to ceiling. Seven reclining seats, two divans, and a desk comprise the only furniture. And Squibb's passengers are warmed only by steam heat from a small boiler just aft of the cockpit.

A business-like air permeates the whole Squibb plane—whose insides can be ripped out by the two pilots and the mechanic in less than 20 minutes. Calls for such transformation to a cargo-carrying status come at least once a week.

"We don't kid ourselves," says Coffin, "that the airlines can't handle emergency deliveries of serums and such much more efficiently than we can. But for fast-moving bulk shipments that can be handled in a fairly routine fashion, nothing can beat our exec plane for efficiency and economy."

President Weicker well knew that the DC-3 was capable of such utility when he bought it in 1946. Unlike most execs now buying aircraft, Weicker has a fairly extensive background in aviation and he understands many of the problems that arise in a successful operation. Weicker had spent many hours in the air as a colonel in World War II when he was Deputy Director of Intelligence, U. S. Strategic Air Force, most of the time shuttling between England and the continent in a DC-3.

With this aviation background, Weicker knew that the cruising speed of the Douglas was best suited to the medium-distance hauls he had to make. What's most important, figures showed the DC-3 to be economical at 150 mph even when fully loaded.

When it came to the actual conversion of the DC-3, Weicker left everything to Rintoul. After stripping the original war-time paint, Rintoul turned the plane over to Larry Potter, Custom Designer of Bethpage, Long Island. Potter still handles the DC-3's repairs.

As for instruments, Rintoul has kept up with each technological improvement. The plane has full de-icer equipment, including equipment for props, carburetors, and windshield. A 100-watt Collins transmitter, a Bendix receiver, and a standard 20-channel VHF system complete the radio gear. Navigational equipment includes two ADF's and an ILS receiver.

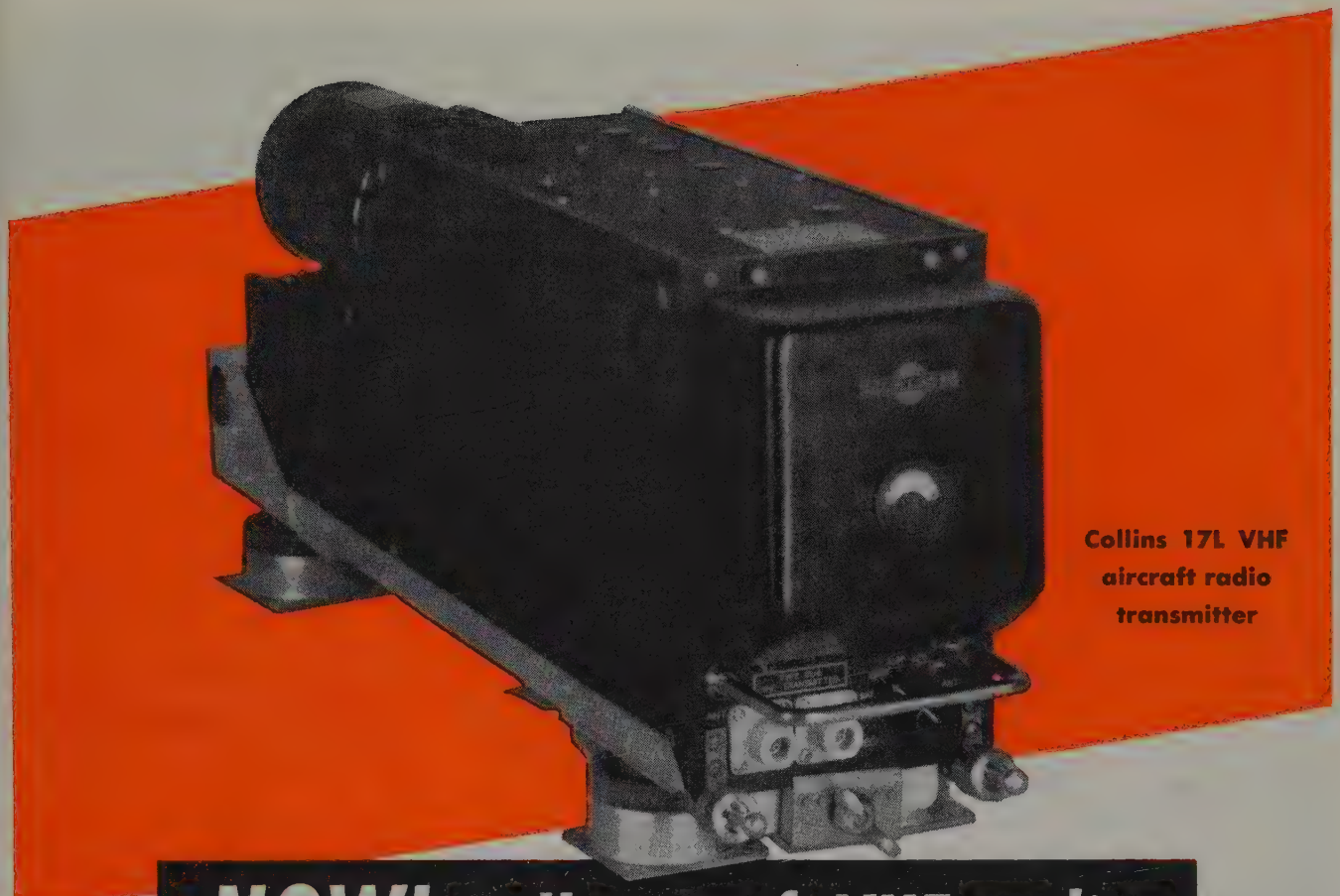
Maintenance is handled—with the pilots' help—by Al Nelson, formerly of Colonial Airlines and Delta. Nelson pulls his big checks after every 200 hours, splitting the difference between the CAA's suggested 100-hour check and the 250-hour check which is current practice on many airlines.

"It's a progressive check," says Nelson, "because I can't lay the plane up for three or four days at a time."

Major overhauls now go to Pacific Airmotive out on the West Coast, but for awhile Nelson used to sell his engines as their time ran out, buying overhauled engines for replacement. Now, he holds three engines at all times, two on the plane, and one always in overhaul. Overhauls are done on a contract basis, but as for buying of gas and oil and getting other maintenance done, Rintoul has avoided contracts.

The company is fully insured, carrying hull insurance, property damage, public liability, passenger liability, and seat insurance, including amounts for accident, disability, and medical expenses.

Is the cost for such a plane, its crew, storage, and operation worth it to Squibb? When you add it all up—the improved public relations from side trips for customers during conventions; the miles conveniently covered by top execs—10,146 in April of this year and 11,523 in May; and when you note that Squibb's net sales have increased from $50,000,000 in 1946 to $100,000,000 in 1951—you know it's worth it. And you know, too, that John Rintoul and his crew and their DC-3 are good salesmen as well as airmen for their company.



Collins 17L VHF aircraft radio transmitter

NOW! Full use of VHF radio by owners of executive aircraft

Civilian "non-carrier" pilots are no longer confined to VHF frequencies of 122.1-122.9 megacycles for air-to-ground radio communications. By amendment of its Rules and Regulations Governing Aeronautical Services, the FCC has enabled *all owners of aircraft regardless of type* to utilize certain frequencies within the band 118.1-126.7 megacycles.

Not only that! Under the new Controlled Materials Plan we are now authorized to use priority DO-J-6 to get materials with which to fill orders from corporation plane owners for Collins 17L transmitters.

The businessman can now equip himself to operate in the same way under instrument conditions as the scheduled airline.

The Collins 17L transmitter provides transmitting facilities on all channels reserved for aircraft communication in the VHF band. Its frequency range is 118.0-135.9 megacycles, and all of the 180 channels assigned in this range are easily selectable over a simple and positive remote control system. The power output on voice is conservatively rated at eight watts. With this power, and the greatly increased number of frequencies now available, the pilot is assured that transmissions will be received and answered at the busiest air terminals.

The 17L is a companion to the 51R navigation receiver with which many executive planes are already equipped. The pair provides reliable two-way radio telephone communication.

We will be glad to send you a more complete description of the 17L transmitter on request.

For reliable radio communications, it's . . .

COLLINS

COLLINS RADIO COMPANY, Cedar Rapids, Iowa

11 W. 42nd St., NEW YORK 18 **1937 Irving Blvd., DALLAS 2** **2700 W. Olive Ave., BURBANK**

★ CLASSIFIED ADVERTISING ★

SKYWAYS' CLASSIFIED ADVERTISING RATES ARE 15¢ PER WORD—FIRST 15 WORDS (MINIMUM SIZE) $2.00

AIRCRAFT WANTED

BUYING AN AIRPLANE? Protect yourself! Airplane reports $3.00. Complete history air mailed within 24 hours. Reports contain major repairs and alterations by previous owners; accidents involving aircraft; liens against title. This and additional information protecting you, a prospective airplane buyer. Give registration number of aircraft in all correspondence. Aircraft Research Co., 1424 K Street, NW, Room 302, Washington 5, D. C.

FOR SALE—used aircraft, parts, equipment. Bargain listings, including business opportunities and auctions. Financing and collections handled. Send detailed inquiries for prompt results. World wide inquiries invited. Miller Aircraft Brokerage, Fort Lewis Terrace, Salem, Va.

AIRWORTHY used aircraft, no charge for listing if you want us to SELL your airplane. If you want to contact buyers yourself, send $1.00 for list. Vertex Aviation Agency, 515 South Emerson, Denver, Colorado.

AIRMART AIRCRAFT, aircraft brokers, 1930 State, Chicago 16, Illinois, have immediate buyers for all types of aircraft. No listing charge.

WILL buy early Navion from owner. No brokers. Good condition and reasonable. M. D. Harnly, 78½ N. Main, Mansfield, Ohio.

McINTIRE ASSOCIATES, 505 North Ervay, Dallas, Texas and Monterrey 101-410, Mexico City have domestic and foreign buyers for good used aircraft. We will forward complete details upon request.

POWERS & GEORGE, Aircraft Brokers, 475 Fifth Avenue, New York City, have purchasers for all types of aircraft from $1500 up. No charge for listing your ship for sale. Write, describing your airplane. "Airplanes Everywhere."

USED PLANES FOR SALE

1946 AERONCA CHIEF. Less than 200 hrs. since new. Always hangared—extras $800. Eric P. Ligotke, 110 Malcolm St., Elyria, Ohio.

AIRWORTHY used aircraft, all types, no charge for your request if you buy through us. If you want to contact owner yourself, send $1.00 for list. Vertex Aviation Agency, 515 South Emerson, Denver, Colorado.

BEECH

BONANZA A-35. #777BS has 390 hours. Relicensed July 1951. Two-way VHF and LF. Omnirange. Never Damaged. Excellent condition inside and outside. In Southwest. $9950.00. MCINTIRE ASSOCIATES, 505 North Ervay, Dallas or Monterrey 101-410, Mexico City.

BEECHCRAFT D-18-S. Eight available from $35,500. File 353 has 409 hour airframe. 18 hours SMOH engines. Hydromatic propellers. This plane is excellent. Asking $59,250. Make offer. McIntire Associates, 505 North Ervay, Dallas or Monterrey 101-410, Mexico City.

BONANZA A-35, Set, D-1974. Executive since new, One pilot, Plastic coated, Gyro panel, LF, VHF, AFF, Flares, Two chair chutes, Nav. Lite flasher, Constant speed prop., Accelerometer, Airframe 820:00, Engine 220:00, Never scratched, Always hangared, Spotless, $10,500. THERMOID COMPANY, Trenton, N. J.

D-18-S TWINS: 10 from $43,000. Corporation Executive #49698S, has zero engines. Reupholstered. Hydromatics. Deicing. Omnirange. Excellent. $62,500. Inquire, POWERS & GEORGE, Aircraft Brokers, 475 Fifth Avenue, New York City. "Airplanes Everywhere."

ALL CLASSIFIED ADVERTISING
accepted with the understanding that it will be placed in the first issue closing after receipt of order. Classified forms close first of second month preceding date of issue.
All Classified Advertising Prepaid

BONANZAS: 32 available. Model 35, #2265VS, has 117 hours. Auxiliary tank. Gyro. New condition. $7000. Also; painted late 1949, #8004AS, with overhauled engine. Late improvements. Extras. Bargain. $9000. Also; late 1950, #5640CS, with 252 hours. Omnirange. New condition. $13,000. Apply, POWERS & GEORGE, Aircraft Brokers, 475 Fifth Avenue, New York City. "Airplanes Everywhere."

BELLANCA

CRUISAIRS: 11 available. Late 1946. #81787S, has all 1947 features. 36 hours since overhauled. Aeromatic. Gyros. Radio. #3100. Also; 1947, #81837S, with 364 hours. Aeromatic. Primary blind. Two-way LF and VHF radio. Beautiful. $4000. Consult, POWERS & GEORGE, Aircraft Brokers, 475 Fifth Avenue, New York City. "Airplanes Everywhere."

CESSNA

140'S: 1948, #2758VS, has 96 hours. Metal propeller. Radio. New condition. $2400. Also; all metal 140's from $3000. Consult, POWERS & GEORGE, Aircraft Brokers, 475 Fifth Avenue, New York City. "Airplanes Everywhere."

170'S: 22 available. 1948, #2255VS, has 300 hours, engine 270. Metal propeller. Primary blind. Radio. Relicensed September. Bargain. $3325. Also; painted all metal, #9583AS, with new engine. Metal propeller. Primary blind. Radio. Stainless stacks. Relicensed. $4750. Apply, POWERS & GEORGE, Aircraft Brokers, 475 Fifth Avenue, New York City. "Airplanes Everywhere."

195'S: 10 available. Late 1949. #9800AS, has 430 hours. Zero time 300 HP. Jacobs majored engine. Gyros. Omni-range. ADF. New condition. Bargain. $13.500. Inquire, POWERS & GEORGE, Aircraft Brokers, 475 Fifth Avenue, New York City. "Airplanes Everywhere."

195A FILE 343 has 460 hours. June license. VHF, LF, Marker beacon. Omnirange. Full blind. Never damaged. One spare zero time engine and propeller included. Only $12,495.00. Inquiry McIntire Associates, 505 North Ervay, Dallas or Monterrey 101-410, Mexico City.

CESSNA 140's and 170's available. All good buys. #257, 1946 140-450 hours total, radio, basic blind, lites, new licensed, $1.375.00. Cessna 19s from $10.750. AIRMART AIRCRAFT, 1930 State, Chicago 16, Illinois.

$1.00 can save you hundreds. Read our Miscellaneous advertisement. AIRCRAFT LISTING BUREAU.

CURTISS

COMMANDOS. Two passenger airliners C-46-A in excellent condition. 4500 hours total time. One C-46-D cargo plane with 2500 hours. Tails not modified. Offered on bid basis. McIntire Associates, 505 North Ervay, Dallas or Monterrey 101-410, Mexico City.

DOUGLAS

DC-3-C AIRPLANES. Three cargo and three passenger airliners offered by airline. Progressive airframe maintenance. Zero time P&W-92 engines. Excellent airplanes offered on bid basis. Inquire McIntire Associates, 505 N. Ervay, Dallas or Monterrey 101-410, Mexico City.

ERCOUPE

ERCOUPES: 1947 #3377HS, has 250 hours. Metal propeller. Primary blind. Radio. Clean. $1500. Also; 1948, #99721S, with 270 hours. Metal propeller. Radio. Loop. Extras. Beautiful. $2600. Make offer. Consult, POWERS & GEORGE, Aircraft Brokers, 475 Fifth Avenue, New York City. "Airplanes Everywhere."

EXECUTIVE TRANSPORT AIRCRAFT

FOR complete market report of available multi-engine aircraft, including Beech, Convair, Curtiss, Douglas, Grumman and Lockheed manufacture, write or call William C. Wold Associates, 516 Fifth Avenue, New York 18, N. Y. Telephone MUrray Hill 7-2050.

GRUMMAN

WIDGEONS: 7 from $12,000. #32139S, has revised hull. Completely rebuilt. Unused. New engines. Hartzell propellers. Gyros. VHF. Corporation owned. Exceptional. $14,000. Also; late G-44A's from $22,500. Apply, POWERS & GEORGE, Aircraft Brokers, 475 Fifth Avenue, New York City. "Airplanes Everywhere."

LOCKHEED

LODESTARS: 12 from $32,000. Beautiful Executive, #57463S, has 8 chairs, divan, desk, buffet, and lavatory. Reupholstered 1951. Hydromatics. Deicing. Best airline instruments and radio. Auto pilot. Relicensed October. 4 spare engines. 2 majored. Excellent. $65,000. Inquire, POWERS & GEORGE, Aircraft Brokers, 475 Fifth Avenue, New York City. "Airplanes Everywhere."

LODESTARS. Ten available. Executive F1221S has 2300 hour airframe. 650 hours total time Wright engines. Four spare engines. Large supply of other spare parts. Two compartment spotless interior. Perfect condition. $67,500. Also several airline interior late model Lodestars available. Excellent for conversions at low cost. McIntire Associates, 505 North Ervay, Dallas or Monterrey 101-410, Mexico City.

LUSCOMBE

8F'S: 90 HP.; 8 available. 1948, 1985VS, has 260 hours. Metal propeller. Primary blind. Radio. Undamaged. Bargain. $1850. Consult, POWERS & GEORGE, Aircraft Brokers, 475 Fifth Avenue, New York City. "Airplanes Everywhere."

1948 LUSCOMBE Silvaire 8E, 140 hours total, hangared, complete instruments, lights, starter and pants. Perfect condition. $1900. A/C B. G. Langhofer, 3565th Trng. Sq:. JCAFB, Waco, Texas.

NAVIONS

NAVIONS: 4 available #424, 490 hours airframe, 290 engine, radio, basic blind, lights, loop, $5500.00. AIRMART AIRCRAFT, 1930 State, Chicago 16, Illinois.

$1.00 can save you hundreds. Read our Miscellaneous advertisement. AIRCRAFT LISTING BUREAU.

SUPER NAVIONS. Five available. #F1238 has 163 hours. New license. LF, VHF, and Lear ADF12 radio. Full blind instruments. Never damaged. Will compare with new. Located west coast. $15,500. Inquire McIntire Associates, 505 North Ervay, Dallas or Monterrey 101-410, Mexico City.

★ CLASSIFIED ADVERTISING ★

PIPER

PIPER PA-16s from $2000.00, PA-20 from $3500.00. All exceptional values. We finance. AIRMART AIRCRAFT, 1930 State, Chicago 16, Illinois.

$1.00 can save you hundreds. Read our Miscellaneous advertisement. AIRCRAFT LISTING BUREAU.

REPUBLIC

SEABEES: 23 from $1650. #6119KS, serial #887, has 275 hours. All improvements. All bulletins. Hangared. Undamaged. No corrosion or leaks. Fresh water use. Clean. $2225. Apply, POWERS & GEORGE, Aircraft Brokers, 475 Fifth Avenue, New York City. "Airplanes Everywhere."

STINSON

STINSON 10-A. Beautiful black and yellow, twenty coat, hand-rubbed finish. Only 230 hrs, since complete custom re-built and new engine. Two-way radio, lights, primary blind, starter. Always hangared. Exceptional condition. Ray Saidel, Merrimack Street Garage, Inc., Manchester, N. H.

STINSON Voyagers and Stationwagons, #105 Stationwagon 165, 710 hours total, 75 SMOH, 2-way MHF & VHF radios, basic blind panel, $3100.00. 18 months to pay. AIRMART AIRCRAFT, 1930 State, Chicago 16, Illinois .

SWIFTS

TEMCO SWIFTS. Several Available. #2550BS has 25 hours total time. Last ship built in 1951. Custom painted. LF, VHF, and Omnirange. Mufflers & Sound-proofing. Deluxe interior. Full blind instruments. This plane cost over $6000 and is equal to new. Any reasonable offer considered. In southwest. McIntire Associates. 505 N. Ervay, Dallas or Monterrey 101-410, Mexico City.

125'S: 20 available. Late Globe, #3298KS, has 335 hours. Overhauled aeromatic. Radio. Extras. Clean. $2000. Also; 1948, #2821BS, with 330 hours. Aeromatic overhauled. Primary blind. Radio. Latest glass and ventilation. Hangared. Undamaged. Bargain. $2500. Also; very late Swifts with extras at higher prices. Inquire, POWERS & GEORGE, Aircraft Brokers, 475 Fifth Avenue, New York City. "Airplanes Everywhere."

TAYLORCRAFT

TAYLORCRAFT SPORTSMAN (new model 19) now available for immediate delivery. America's finest 2-place, side by side airplane. Extra big baggage compartment gives 4-place cargo utility. Lowest price including starter, generator, 12 volt system. etc. Ideal for CAP, farm business man, training. See your local airport operator or write today, TAYLORCRAFT, INC., Conway-Pittsburgh Airport, Conway, Penna.

AVIATION EQUIPMENT & SUPPLIES

NOW HEAR THIS! NOW HEAR THIS—The new Monitoradio enables you to sit home and listen to the activity on your airport. Hear incoming planes ask for landing instructions and control tower advise the traffic. Table radio complete with speaker covering all VHF bands from 107-134 MC, AC-DC. Airlines buying for station Monitors—Limited quantity available due scarce materials. Must have deposit $9.50 attached to order—balance COD. Price $49.50. Paul Rennard, Lamberton Airport, Franklin, Pa.

GENUINE Navy intermediate flight jacket, new, dark brown goatskin leather. Bi-swing back, two patch pockets, one inside snap pocket. Completely lined finest rayon. 100% wool knit cuff and waist. Zippered front. Sizes 34-46 only $32.50. Write for (Free Catalogue). We pay postage if payment accompanies order. C.O.D.'s upon request. No C.O.D.'s overseas. R. A. F. Mfg. Co., 2715 W. Madison St., Dept. SK-2, Chicago, Ill.

ATTENTION MR. AIRPLANE OWNER! If your plane has 12 volts, you should not be without the famous Fanmarker Beacon receiver. Identifies almost 3000 fan markers that make up the radio aids to navigation. Complete ready to install with panel light $39.50. Must have $9.50 deposit with order. Limited quantity available. Worth over $100.00. Paul Rennard, Franklin, Pa.

MAKE any field a landing field with Gruss Hydraulic Safety Struts. CAA approved. Set $65.00. No bounce landings, cross-winds takeoff, perfect rough field taxiing, self installed, outlasts your plane. For farmers, sportsmen, instructors. Fits Pipers only. Write today. L. C. N. Corporation, 1501 Oxford State Road, Middletown, Ohio.

PATCHES, Military or Civilian wings stamped with gold, silver or burned. Wings and name $1.00 each. 3 for $2.00. Names only 2 for $1.00. Julie's Leathercraft, Lone Tree, Ia.

COMBINATION CODE AND PHONETIC ALPHABET DECAL inset with your aircraft radio call number. Two for $1.00. Safetycals, 25 Woodridge, Muncie, Indiana.

NAVION OWNERS: Install the original landing gear fairing to be approved by CAA for the Navion. H. E. Tennes, 801 Burlington Ave., Downers Grove, Ill.

GENUINE Navy Intermediate Flight Jackets, brand new, dark brown goatskin leather, bi-swing back, two patch pockets, one snap pocket, mouton collar, celanese lined, 100% wool knit waistband and cuffs, zippered, sewed with nylon thread. Sizes 34 to 46. Price $35.00 each. The Genuine USN issue. Flying Equipment Sales Co., 1641-5 W. Wolfram St., Dept. S, Chicago 13, Ill.

BATTERIES & TIRES: Brand new, for all type aircraft. Bargains. Send for free list. Many other items; write your requirements for quotation. Flying Equipment Sales Co., 1641-5 W. Wolfram St., Dept. S, Chicago 13, Ill.

GLOVES: Navy Pilot Gauntlet, goatskin, baby lamb lined, one finger mitten type $7.95 pair. B3A AAF Flying Gloves, dark brown kidskin leather with elastic take-up wrist, size 9 only $2.95 pair. Dark brown wool gloves, leather palm $1.95. New. State size. Flying Equipment Sales Co., 1641-5 W. Wolfram St., Dept. S, Chicago 13, Ill.

HELMETS: AMH-15 AAF tan cloth, sponge rubber earcups $2.00. A-11 AAF kidskin leather sponge rubber earcups $3.45. Chamois helmet $1.00. Leather helmet with chincup $1.50. White cloth helmets $1.00. White flying caps 75¢ each. All new. Flying Equipment Sales Co., 1641-5 W. Wolfram St., Dept. S, Chicago 13, Ill.

ANJ-NAVY Winter Flight Trousers, sheepskin lined leather only $6.75 pr. B2 Pilot Cap, dark brown sheepskin lined leather $2.00, medium and large sizes. Flying Equipment Sales Co., 1641-5 W. Wolfram St., Dept. S, Chicago, 13, Ill.

SUN GLASSES: Genuine Ray-Bans made by Bausch & Lomb, gold filled frame. Ladies' or Gent's style $7.95 pair. Gent's type with sweat bar $10.95. Shooting Glasses with sweat bar $13.00. Gradient density type $9.45. Flying Equipment Sales Co., 1641-5 W. Wolfram St., Dept. S, Chicago 13, Ill.

YOUR Leather Jacket renovated expertly. FREE circular. Berlew Mfg. Co. Dept. 33, Freeport, N. Y.

BOOKS

METEOROLOGY—An up to date questionnaire for the Private, Commercial and Instrument Pilot, $2.00. Pass that examination the first time. Flying 'L' Aero Service, 731 North Custer St., Colorado Springs, Colorado.

CIVIL Air Regulations handbook for pilots. Vest-pocket edition, 50¢. Ross Publications, Box 2092, Arlington 4, Virginia.

MAGAZINES (Back Dated)—Foreign, Domestic—Arts, Books, Booklets, subscriptions, etc. Catalog 10¢ (refunded). Cicerone's, 86-22 Northern Blvd., Jackson Heights, N.Y.

BULLET Raceplane. Homebuilt, Fast, low-winged lightplane. Complete Blueprints $2.00. Corbcraft, 81-S Elmerston, Rochester 20, N. Y.

AVIATION QUIZ BOOKS—The following outstanding books by Charles A. Zweng lead the field and prepare you for your rating. Included with each book are authentic examinations with new material not available elsewhere. Also included is a late Government Weather Map pertinent to the examination. Why take a chance? Zweng books include: Flight Instructor $3.50; Flight Engineer $4.00; Link Instructor $4.00; Private & Commercial Rating (with the new examinations) $3.50; Instrument Ratings $4.00; Meteorology for Airmen $3.00; Aircraft & Engine Mechanic including hydraulics, weight and balance $4.00; Parachute Technician Rating $3.00; Flight Dispatcher $4.00; Civil Air Regulations $1.00; Airport Operation and Management $4.50; Zweng Aviation Dictionary $6.; Aeronautical Navigation $3; Practical Manual of the E6B computer $2.50; Ground Instructor Rating $4.00; Flight Instructor Oral Examination $1.00; Control Tower Operator, our Flight Dispatcher covers most of the control tower examinations, $4.00; Leading Airline Executives and Pilots owe their success to early training with Zweng texts. Pan American Navigation Service, 12021-22 Ventura Blvd., N. Hollywood, Calif. (Free Catalog).

FLYING THE OMNIRANGE by Charles A. Zweng. New "first edition" fully illustrated, designed to aid the pilot in flying the new Omnirange Stations now being established by the C.A.A. Order now C.O.D. or postpaid. DeLuxe edition only $4.00. Important books on aviation by other authors include: Crop Dusting (set of 6 manuals) 12.50; DeLuxe large Airline Log books $6.50; other Logs $1.00 up; Air Officer's Guide $3.50; Jet Aircraft Power Systems $5.50; Stick & Rudder $4.50; A Flier's World $3.75; Wright Brothers $5.00; Naval Officer's Guide $4.00; Electronic Navigation $4.50; Aircraft Carburetion $3.75; Long Range Flight $3.50; Air Navigation (Weems) $4.50; Air Transport Navigation $6.00; Meteorology with examinations $3.00; Conquest of Space $3.95; Helicopter Guide $2.00. Pan American Navigation Service, 12021-22 Ventura Blvd., N. Hollywood, Calif.

C.A.A. RATINGS: Try up-to-date Ross Guaranteed Questionnaires to help you obtain your C.A.A. Ratings! Ross Questionnaires have been used by thousands of Pilots, Mechanics, and Instructors as they are the only source for current typical exams. Select your Ross Questionnaires from the list below. "Private Pilot $1.00"; "Commercial Pilot $4.00"; "Flight Instructor $4.00"; "Instrument Pilot $4.00"; "C.A.R. for Pilots 50¢"; "Engine Mechanic $3.00"; "Aircraft Mechanic $3.00"; "Meteorology Instructors $2.50"; "Navigation Instructors $2.50"; "C.A.R. Instructors $2.50"; "Engine Instructors $2.50"; "Aircraft Instructors $2.50"; "Fundamentals of Instruction $1.50"; "Parachute Rigger $2.50"; "Control Tower Operator $2.50." As a special offer for Students and Schools, the Complete set of above Questionnaires may be purchased for $15.00. Don't Hesitate, order today. Remember! If you are not completely satisfied with any Ross Questionnaire your money will be refunded in full. Order direct from Ross Aero Publishers, Administration Bldg., Dept. 1-S, Commercial Airport, Tulsa, Oklahoma. Save Money, Time, and Effort.

(Continued on page 60)

CLASSIFIED ADVERTISING

(Continued from page 59)

BOOKS, Continued

HOW TO BUILD ONE-PASSENGER FLYING PLANES—Manual. Contains complete construction details and drawings. 64 pages. Profusely illustrated. Postpaid $1.00. "Home-Built Aircraft" magazine. Sample copy 25¢. Roy Bohreer, 304 West Chickasaw, McAlester, Oklahoma.

STUDENTS, Mechanics, Flight Engineers: "Aero Mechanics Questionnaire" by Ralph Rice. A greatly enlarged and completely revised printed edition. 222 pages of multiple-choice questions, answers, and explanatory notes covering all phases of Aircraft and Engine Mechanics including Power Plants, Carburetion, Lubrication, Propellers, Electricity, Woodwork, Dope and Fabric, Sheet Metal, Welding, Rigging, Weight and Balance problems, Hydraulics and Civil Air Regulations based on current issues. $5.00 postpaid, or c.o.d. plus postage. Address: Paxon Publications, Box 479, Lawrence, Kansas.

LEARN TO FLY with the Aviation Cadets. Men 18 to 27 get $105. a month while learning. Prepare quickly for qualifying examinations. Guaranteed "Practice Tests" with answers—Cadet and Officer Candidates—each $3.25. Both $5.00. Prepaid. Cramwell Books, Air Institute, Adams, Mass.

HELP WANTED

CO-PILOT MECHANIC for employment in eastern U.S. with major oil company. Desired qualifications are: Age: 21-35; Education: High school graduate; C.A.A. Ratings: Commercial Pilot, Single and Multi-Engine Land, Instrument, Aircraft and Engine Mechanic; Experience: 2,000 hours—Total Flying Time; 1,000 hours—Multi-Engine time; 50 hours—Actual instrument time. Please furnish complete history in first letter including previous employment, marital status, etc., and attach recent photo. This corporation operates a fleet of airplanes and opportunity for advancement to first pilot is very favorable. Write Box 325, SKYWAYS.

FOREIGN & LATIN AMERICAN EMPLOYMENT. 1952 "Foreign Service Directory" gives Up-To-Minute Facts on Military & Civilian Construction, Government Jobs, Major Oil Listings, Aviation, Transportation, Steamship Lines, Mining, Importers, Exporters, How-When-Where to apply, application forms, Hot List Firms Hiring. $1.00 postpaid. Global Reports, P.O. Box 883-SS, Hollywood 28, Calif.

ALASKA—Last American Frontier. $1.00 brings 1952 Business Directory, Government Map, Construction Projects Military & Civilian, Homestead & Highway facts, Hunting-Fishing-Game Rules, Mining, Aviation. List of firms hiring. How-When-Where to apply. Alaska Opportunist, P.O. Box 883-SS, Hollywood 28, California.

SECRETARY: Thoroughly experienced, capable, and reliable with knowledge of civil airplanes for aircraft brokers office midtown New York. Private license preferred. Write SKYWAYS, Box 326, stating qualifications. Salary. Photo requested.

POSITIONS WANTED

LICENSED AIRCRAFT AND ENGINE MECHANIC with 14 years experience in aircraft and engine maintenance. High School and Technical School graduate. Have Commercial, multi-engine land rating with 400 hours total time. Seek employment in aircraft maintenance with Corporation who operate and maintain their own aircraft. Married, 37 years old, 5 years foreign service, desire to relocate in U.S.A. H. J. Dannemann, 19 Huston Street, Towanda, Pa.

AIRLINE Pilots Rating, 7000 hours, 6 years airline, Box 10, SKYWAYS.

INSTRUCTION

PASS CAA WRITTEN exams our quick easy way. Our guaranteed CAA type exams are brought up to date weekly and really do the job. Four Commercial subjects $6.00; three Instrument subjects $5.00; individual copies $2.00. Send for your copy today. Acme Flying School, Meacham Field, Fort Worth, Texas.

NAVIGATOR Rating Examinations included in New Aeronautical Navigation by Charles A. Zweng, $3.00; Fairchild Surplus. (Electrical Averager) Sextant $17.50: PILOTS supplement your training. Order "Ground Instructor" $4.00 and "Ground Instructors' Rating" $4.00: Examinations included. These books by "Zweng" prepare you for increased earning power. Pan American Navigation Service, 12021-22 Ventura Blvd., N. Hollywood, Calif.

INSTRUMENTS

NAVIGATION INSTRUMENTS: Beautiful new and reconditioned precision instruments. Brand new Link Aircraft Sextants with case $37.50; Fairchild averaging type $17.50; Bausch & Lomb Sextants, excellent condition $49.75; Hamilton 24 hour Master Navigation Watches $65.00; Pioneer Panel Compass (new) $17.50; Dalton Model "G" Computer (new) $7.50; Weems Mark II Plotter $2.00; Dalton E-6B Computer $10.00; A-2 Deluxe Computer with case $3.00; American Airlines Computer $5.00; New Dalton E-10 computer (metal) includes scale for pressure pattern flying $24.00; Astro Compasses (new) $12.50; (Free Catalog). Pan American Navigation Service, 12021-22 Ventura Blvd., N. Hollywood, Calif.

MISCELLANEOUS

AIRPLANE BUYERS AND SELLERS can now deal direct, and save time and money. Owners of aircraft listed in our files can sell their airplanes at prices hundreds of dollars less than those sold by brokers, because there are no commission or middleman's fees to pay. Three times monthly we inform the aircraft owner who wants to buy his type of airplane, he contacts the buyers, and they make their own deal. That's all there is to it. The only charge is $5.00 to list an airplane, $1.00 to receive listings of aircraft for sale. Write today telling us what you want to buy. We can save you hundreds of dollars. AIRCRAFT LISTING BUREAU, 1907 Archer, Chicago, Illinois.

HANKS Air Exchange—where buyers and sellers get together. Sensational Opportunity to sell your airplane. Anxious buyers waiting. Receive 4 large lists of buyers for only $4.00. Hurry, those customers are impatient. You need a Plane? Send your name and what wanted, etc., together with 75¢. Large selection to choose from. Box 8146 Dawson, Tulsa, Oklahoma.

AIRPORT operators send today for TAYLORCRAFT, dealership information. Get in early on big expansion program. TAYLORCRAFT, INC., Conway-Pittsburg Airport, Conway, Penna.

HELICOPTER, build from spare parts or kit. Catalog and blueprints, $5.00. No model. AERO-TECH, 601 Jefferson Street, Montgomery, Alabama.

HELICOPTERS, Blueprints, Construction Kits, flying models. Catalog $1.00. Refunded with first order. AERO-TECH, 601 Jefferson Street, Montgomery, Alabama.

WANTED 16 HP 2 cycle righter target drone engine. State condition and price. Gordon Springborg, 4400 Turner St., Lansing, Mich.

LEARN TO FLY and get paid for learning. Read advertisement under BOOKS classification. AIR INSTITUTE.

ATHLETIC equipment, body building courses. 100 TRICK Knockouts for self defense. $1.00. 1¢ each. Priest, Box 251G, Evanston, Ill.

Combat Chasers

(Continued from page 42)

at Inchon. Due to the distance of Inchon from other front-line ground operations, a carrier take-off was necessary.

Accordingly, an L-17 *Navion* was hoisted aboard the *USS Badoeng Strait* at Sasebo, Japan. A few days later, scarcely assured by the carrier pilots' confident words, Capps climbed into the cockpit of the *Navion* and sent it scooting down the 550-foot flight deck. A 29-knot wind was blowing, and with this aid, Capps lifted the little airplane off the deck after a record short run of 300 feet. A few minutes later he landed on a highway just outside of Inchon, picked up Gen. Almond, and took off again for a front-line inspection trip.

The general run of Air Force airplanes are designed to do one job only and do it well. Fighters fight and bombers bomb. The AF pilots are specialists in their line of duty. In the Army aviation business, it's a different picture. Here, variety pays off in jackpot amounts. A plane and pilot are not gauged by their ability to do one job and do it well, but they are valued according to the number of emergencies they can meet and cope with. Conventional operations under these conditions are the exception—unconventional methods are welcome when they produce the desired results.

Take, for instance, the L-17 *Navion* pilot who spotted an enemy T-34 tank clanking along the road. The pilot buzzed lower for a better look. What happened is not in the books. Evidently the tanker mistook the *Navion* for one of its vicious big-cousin F-51's, for he swerved suddenly, left the road, then tipped over in the ditch.

Nor is it conventional for a pilot to leave the Army air base in an airplane, then return to the field riding piggy-back on an enemy prisoner. But Lieutenant Donald Bazzurro, of Staten Island, N. Y., accomplished that bizarre feat. He was riding as an observer in an L-4 when suddenly a group of Korean fighter airplanes streaked down. The lightplane went into a spin in trying evasive action and crashed on an open hillside. The pilot was seriously injured, and Bazzuro's left ankle was broken.

But it was only a few miles to the UN lines, so Bazzurro hobbled off to seek help. He found it unexpectedly. The first person he encountered was a North Korean rifleman. The Army aviator whipped out his .45 automatic and took the man prisoner. Then what? He mounted him piggy-back and forced the prisoner to carry him to safety. A patrol went back a short time later and rescued the injured pilot.

The recent arrival of Air Force mosquito squadrons in the Korean theater, used to direct air strikes, has taken over some of the jobs formerly accomplished by the Army lightplanes. But there's still plenty of jobs for them to do. The mosquito squadrons just give the Army aviators more time for the numerous speedy draft-horse jobs necessary to keep a war running smoothly.

The total of draft-horse jobs to be accomplished is best indicated by one officer's terse description of the Army aviators themselves. "I tell you," he said vehemently, "those guys can do anything."

NAVICOM

RTCC in Successful Operation

Progress Shown at Washington's Radar Traffic Control Center

Radar was sweated out as a traffic-control tool during the Berlin Air Lift. This was not just GCA, which had amply proved its worth during the war. It was the use of radar to speed up air traffic in soupy weather by the sequencing and spacing of arrivals at a highly saturated air terminal.

It was on the basis of this experience that the experts who worked on the SWG-5 Report, *"Air Traffic Control and National Security,"* were able to arrive at the following conclusion and make it a major recommendation of their report. "Airport Surveillance Radar should be considered the primary traffic-control facility in congested terminal areas during the Transition Period (of the Common System). All procedures, traffic patterns, control displays and computers should be designed to supplement the radar and to serve the radar controller."

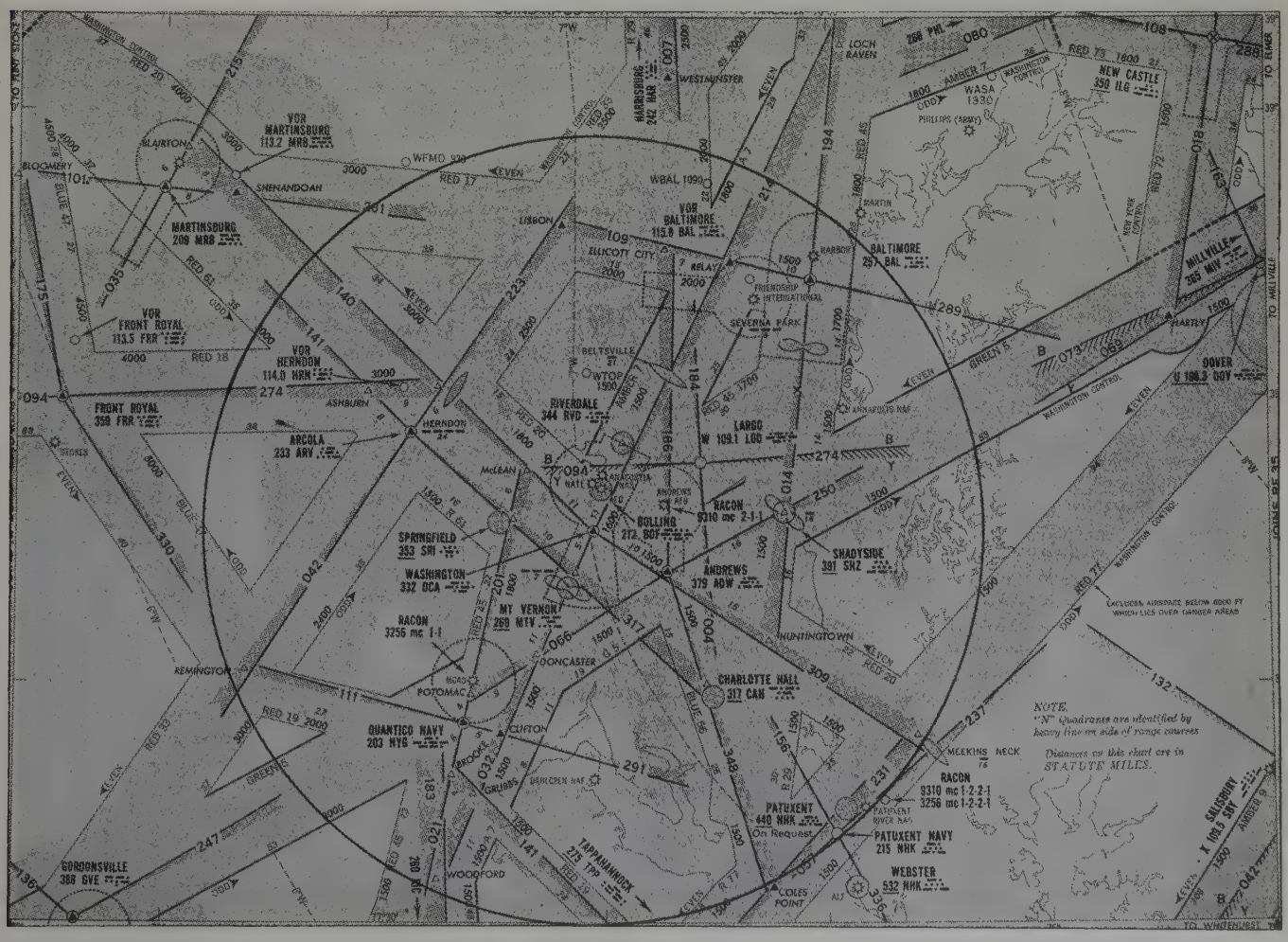
Washington Tests ▶ The first full-scale tests of these procedures are being worked out at the Washington National Airport. The resulting experience derived from the world's first combined military-civil radar traffic-control center will prepare the way for similar centers at New York, Los Angeles, Chicago and other metropolitan areas. (*See SKYWAYS, July 1951,* Navicom *section, for a preliminary description of the equipment and procedures*).

As of early 1952 the installation at the experimental radar control room in the Washington National tower and the actual operational procedures were far enough along to show definitely that the conclusions arrived at by the SWG-5 people were sound. Work has begun on the permanent Washington Radar Traffic-Control Center to be located in Hangar 6 on the airport and it is expected to be in operation by late 1952.

MEW Equipment ▶ One of the key items of equipment is the huge CPS-1 microwave (now known as the AN/FPN-12) early warning (MEW) radar set up on the hill back of DCA. This had been on loan from the Air Force but recently has been transferred to the CAA. It is capable of detecting aircraft up to 100 miles away, but for traffic-control purposes its use will be limited to about 70 miles. It is handled by the Enroute Controller.

(*Continued on page 62*)

WASHINGTON Terminal Area has 40-mile radius *(circle)*. Approach Control clears traffic through fixes at Springfield, Mt. Vernon


VOR MARTINSBURG 113.2 MRB
MARTINSBURG 209 MRB
VOR FRONT ROYAL 113.5 FRR
FRONT ROYAL 359 FRR
VOR HERNDON 114.0 HRN
ARCOLA 233 ARV
VOR BALTIMORE 115.8 BAL
BALTIMORE 257 BAL
RIVERDALE 344 RVD
LARGO 109.1 LGO
NEW CASTLE 350 ILG
MILLVILLE 365 MIV
DOVER 198.3 DOV
SPRINGFIELD 333 SRI
WASHINGTON 332 DCA
MT VERNON 269 MTV
RACON 3256 mc 1-1
BOLLING 272 BOF
RACON 9310 mc 2-1-1
ANDREWS 379 ADW
SHADYSIDE 381 SHZ
CHARLOTTE HALL 317 CAN
QUANTICO NAVY 203 NYG
PATUXENT 440 NHK On Request
PATUXENT NAVY 215 NHK
RACON 9310 mc 1-2-2-1 3256 mc 1-2-2-1
WEBSTER 332 NHK
GORDONSVILLE 368 GVE
TAPPAHANNOCK 215 TPP
SALISBURY 1095 SBY
NOTE. "N" Quadrants are identified by heavy line on side of range courses
Distances on this chart are in STATUTE MILES.

Washington Radar TCC Shows Operational Progress

(*Continued from page 61*)

The 40-mile radius Washington terminal area (*outlined in chart*) is handled by the Terminal Area Controller. He has before him one of the VG-2 *Skiatrons* made available to the radar control center by the Navy. This is a greatly enlarged radarscope (25-inch instead of the usual 12-inch diameter) connected with the MEW radar. On its horizontal surface is indicated the approach pattern to the instrument runway at DCA (002° —182°). The controller places plastic markers on the *Skiatron* to represent aircraft, and thus always has before him a pictorial presentation of air traffic in the terminal area (*see photo*).

RTCC Operation ▶ Since last summer the experimental Radar Traffic Control Center (which is separated from DCA's conventional air traffic control center by heavy black drapes to keep out light) has been monitoring all military and civil aircraft in the area during IFR weather. It has assisted in spacing of aircraft as they start on final approach at DCA, and in guiding Air Force planes around the stacks to line them up for final approach at Andrews AFB, 10 miles to the east. This latter function had been performed previously by the Air Force.

In addition to this, for several months the Radar TCC has been monitoring the *departures* of civil aircraft in VFR weather and has recently set this up as a definite part of the operational procedure. It may hardly yet be termed "radar control," but it represents a big step toward it. When the permanent RTCC is in operation in Hangar 6, there will be two controllers for the outgoing traffic and four for the approaching traffic, each with his own 12-inch surveillance scope tied in to the MEW radar by means of an underground coaxial cable, such as is used in television.

Info Bulletin ▶ In this connection it may be of interest to refer to one of Stan Seltzer's *Information Bulletins* put out by the Airport Traffic Control Tower, Washington National Airport. Stan has been Chief of the Washington Tower for some time, but has just left to take a position with the Air Transport Association's Air Navigation & Traffic Control division, headed by spark-plug Sam Saint.

The bulletin is headed "Touchy Subject," and is addressed to military, airline and other civil pilots. A few quotations follows: *"No doubt many of you have had occasion to run into the VFR radar departure program with which we are experimenting at Washington National, and you're wondering what it is all about. For a long time people have been discussing the 'pros and cons' of calling traffic information for the pilot during VFR weather by reference to our radarscopes in the tower. It has generally been considered that the volume of traffic might prevent a controller from doing a good job since he might have too much traffic to watch and might not be able to give all necessary information.*

"It has also been thought that it might not be too well received by pilots, since our Airport Surveillance Radar (ASR) scope from which we get this information does not give any altitude data. As a result we might 'scare your pants off' by reporting a considerable amount of converging traffic when actually the traffic might be several thousand feet above or below you. It has also been thought that some pilot might be given a false sense of security—believing that radar will see all and tell all—thus encouraging the pilot to relax his own vigil.

"These possibilities have all been considered and talked about, and our controllers felt that the best way to find these answers was to try it out. Then, based on our experience and the experience of many pilots, we can compare notes and discuss it with a more realistic outlook.

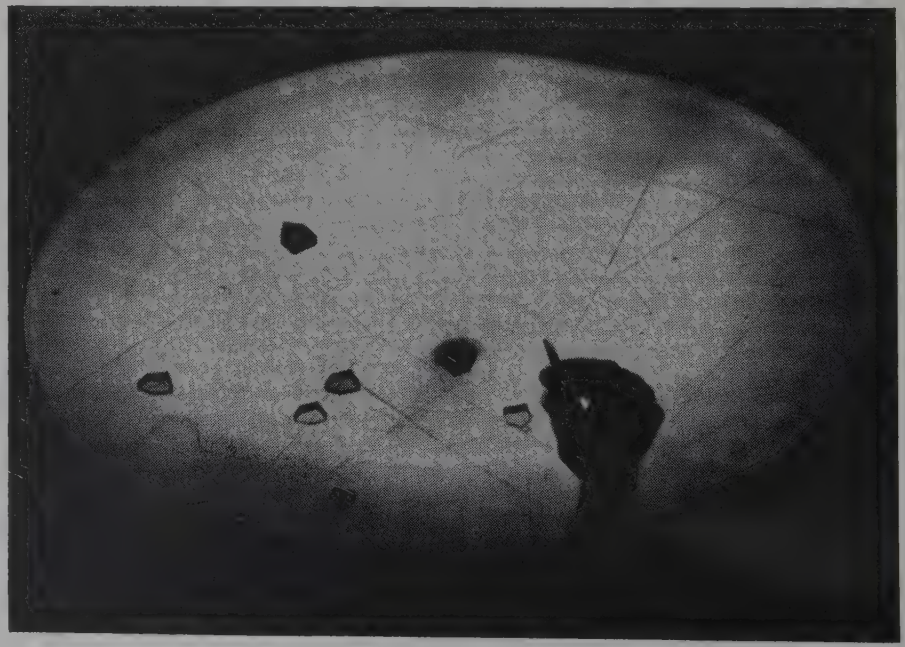
"We think it important that everyone understands some of the limitations of the ASR scope which we use. This scope gives us distance and azimuth only—not altitude. For our normal purposes we operate this scope on a 20-mile radius of Washington National Airport. There is a normal 'blind spot' over the MEW radar antenna—somewhat like the cone of silence over a radio-range station. It is also possible to have other blind spots in other areas caused by obstructions between an aircraft and the radar antenna. Certain aircraft give much weaker targets on the radar than others. For example, a Twin Beechcraft is a particularly poor target, especially when observed from a tail-on position.

"The radar antenna operates like an airport beacon, and in the case of our particular MEW installation, makes one revolution about once every 2½ seconds (24 rpm). It has a rather definite area of scan, and our top altitude is normally from 6,000 to 8,000 feet. There have been times when we have observed aircraft as high as 10,000 feet, but this is not usual. The bottom altitude will vary according to your distance from our ASR antenna—which is located on Aurora Hills, about one mile west of the airport. Generally speaking, we can spot targets at approximately 20 miles provided they are not lower than 2,000 feet. This may vary in various directions, depending upon terrain and obstructions. As an aircraft approaches the field we can see him at lower altitudes.

The ASR scope should not be confused with our Precision Approach Radar (PAR) which is used for instrument approach purposes and scans a narrow sector approximately nine miles south of the airport. This latter equipment does give altitude information along with azimuth and range information.

"Although we have pointed out that radar does have blind spots and targets can suddenly appear on our scope where there were none a moment ago, (such as aircraft climbing or descending into our area of scan), the stuff does serve a definitely useful purpose. We have found

AIRCRAFT show up on 25-inch scope of king-sized radar, called Skiatron, and their pips are identified by plastic markers which are moved in by airways specialists as planes near airport



it a valuable aid in helping us to better plan and handle our traffic. It gives us a better over-all picture of the situation in the area.

"We hope it may work out that you pilots, too, will find this equipment can be of some use to you. Considerable use is made of it in our normal handling of IFR traffic. Perhaps it can some day be applied in the normal handling of VFR traffic. At present we are anxious to find answers to these and many other questions: 'Can it be done with each and every departure? How about during periods of heavy traffic? How many aircraft can we follow at one time? Over how many different routes? Do we load up the frequency? How can we say it shorter and snappier and still make it plain to the pilot? Is it doing any good? Do the pilots like it?'"

This bulletin was put out during the summer, and conversations with pilots flying all types of aircraft indicate a mixed reaction, as is expected with any radically new set of techniques and procedures. When the radar controllers ask pilots regarding certain positions so as to check the accuracy of their radarscope indications some have shown annoyance, but most have been glad to cooperate.

Clarence N. Sayen, president of the Air Line Pilots Association, in discussing the radar traffic-control problem said: "There is a strong feeling that proper use of radar can increase both the efficiency and safety of air traffic control, but we are convinced that over-selling or careless inattention to important operational details or lack of agreement on standardized methods and procedures will destroy the potential advantages of this new tool of control." Sayen has appointed four senior pilots from AA, UAL, BAL and Capital Airlines as an ALPA Radar Control Committee to work with the CAA on the problem at national level.

. . . you should know that omni is now nationwide . . . three hundred omni-range stations blanket the country . . . you can plan your flight from coast to coast on omni-ranges. For crystal-clear reception and reliable pin-point VHF omnigation, NARCO's Omnigator is your best buy. It is designed for both small and large aircraft owners . . . simple to install . . . safe and relaxing to operate and you can never be lost. The Omnigator outperforms any competitive equipment.

Leighton Collins, Editor of Air Facts, has logged a comprehensive story, "5000 Miles by Omnigator," in Air Facts Magazine. He states, in summary, "A cross-country exploration and study of our elaborate omni-range and ILS facilities reveal that the system is incredibly good and that, for the first time, the small plane owner has something he can rely on in fair weather or foul, high or low, and especially in thunderstorm areas."

For a complimentary copy of this Omnigator story, write NARCO.

narco NATIONAL AERONAUTICAL CORPORATION
AMBLER, PA.

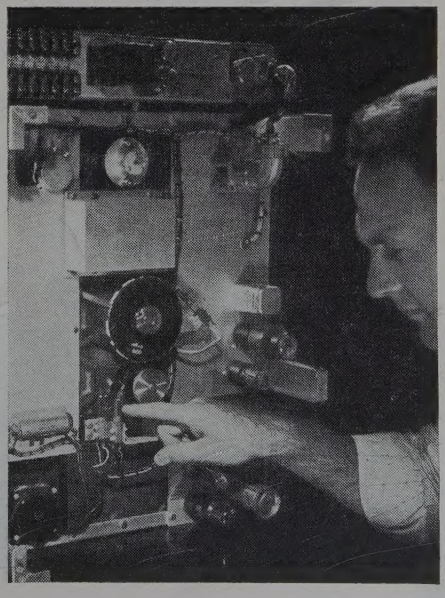
Perfection in electronics

VOICE Identifiers Tell Pilot's Position

Up to a few months ago all presently installed ground radio aids to air navigation identified themselves in Morse code dot-dash-dot signals. The CAA has recently announced, however, that its long deferred (for financial reasons) program to provide these facilities with voice identification equipment is now moving rapidly ahead. The ground aids primarily affected are Omnirange stations (VOR's), plus a number of VHF Fan Markers (FM's), a few Compass Locators (LOM's, or outer markers), and in fiscal 1952-53 a few Visual-Aural Ranges (VAR's) and Low Frequency Ranges (SMRA's) will be included.

Installed Cost ▶ For this year 32 locations are planned; current and pending installations are from 1950-51 funds. The basic unit is the Collins Radio Co.'s Voice/Code reproducer, developed for the CAA. The unit is now being produced by the Maryland Electronic Manufacturing Co., with Collins making certain components. Cost of equipment is about $900, with $1,500 for complete installation. For VOR's, VAR's and FM's, two units are required for each installation, one being used as a safety standby; one unit only will be used for LOM's.

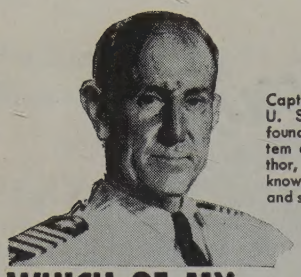
VOICE-CODE REPRODUCER—Radio engineer A. J. Stein points out circuit breaker



Considering the highly important psychological and practical value to the pilot of the voice identification feature, its installation as a ground station is not regarded as an expensive modification. At a recent meeting of the ACC/NAV Panel, representatives of the military air carriers, airline pilots, corporation aircraft users and private flyers backed a CAA decision to include as large a number of the units in the 1953 program as funds permitted.

Safety Factor ▶ The voice tells the pilot exactly what range station or marker he is tuned to, which helps eliminate the danger of misidentification of station. Obviously, disastrous results are possible if a pilot, thinking he is receiving signals from a certain VOR station, is actually tuned to another one in a different location. This is believed to have happened in at least two or three of the crashes during the winter of 1950-51.

(*Continued on page 64*)



Captain P. V. H. Weems, U. S. Navy, Retired, founder of Weems System of Navigation, author, internationally known consultant on air and sea navigation.

WHICH OF MY NAVIGATION AIDS DO YOU NEED?

U. S. AIR FORCES, MAJOR AIR LINES AND FRIENDLY GOVERNMENTS use many of my navigation aids and instruments as standard equipment. Of these, navigation "musts" for pilot and student alike are the Weems Mark II Aircraft Plotter, the Dalton E-6B, or Mark VII Computer. A few of my navigation aids and instruments are described below. Many others are described in my FREE 26-page catalog. Write for your copy today. Address Dept. 6.

WEEMS MARK II PLOTTER: Scale fits sectional and world air charts. Used for plotting bearing, courses, measuring distances, constructing wind diagrams and angles. Only $2.00.

DALTON E-6B COMPUTER: Two sides. One for solving all vector problems—wind, true heading, ground speed. Other side graduated for computing speed-time-distance, fuel consumption, air speed and altitude corrections, as well as statute-nautical mile conversions. Only $10.00.

DALTON MARK VII COMPUTER: Vector side "mocks-up" track-drift-true heading triangle, allows simple, easily oriented setting-up and solution to all wind problems. Computer side for speed-time-distance, fuel consumption, air speed and altitude corrections, and statute-nautical mile conversions, plus erasable air speed calibration chart and flight log. Only $5.00.

MARK VIII-A COMPUTER: A circular slide rule with additional scales for altitude and airspeed correction and for density altitude. Does all dead reckoning computations except wind-drift and other vector problems. Only $1.50.

LINK BUBBLE SEXTANT: Simple, rugged construction assures perfect adjustment at all times. Light weight and correct balance eliminate muscular tension and make accurate observations easy to obtain. Optical system permits direct observation of stars, prevents possibility of observing wrong star. Price, with spare bubble, case and accessories . . . $37.50.

NEW NAVIGATION BOOKS: *Flying the Omnirange* by Zweng. $4.00. *Practical Air Navigation* by Lyon. Basic for pilot and student alike. $2.50. *Instrument Flying* by Weems & Zweng. $4.50. *Electronic Navigation* by Orman. Covers Radar, Loran etc. $4.50. *Government Charts and Publications*: A complete line.

WEEMS AIR NAVIGATION SCHOOL: Since 1927. Resident-Home Study Courses. Catalog free. Enrollment approved under G.I. Bill.

"See your Aviation Supply Dealer" or send today for this 26-page catalog. It's FREE!

AIR WSN WEEMS SEA SYSTEM OF NAVIGATION
ANNAPOLIS, MARYLAND

VOICE Identifiers Tell Pilot's Position

(*Continued from page 63*)

Thus the Oakland (Calif.) VOR station (one of three now operating) used to identify itself in Morse code as "da-da-da (O), dit-da (A), da-dit-da (K)." Now the pilot hears "OAKLAND OMNI; da-da-da, dit-da, da-dit-da" and repeat. Other early VOR installations were at Dallas, Texas and Long Beach, Calif. One of the first of the fan marker installations for Voice/Code was near New Rochelle, N. Y., on the busy Boston-New York run. By the time this appears in print several more are expected to be operating (*see list*).

How it Works ▶ In order to assure long life without breakdown or wear, the voice is not reproduced from a phonograph record, wire recorder or ordinary sound film. Collins engineers have reproduced it from a 16-mm photographic sound track firmly mounted on a rotating wheel in a reduction drive train. The film passes between a light source and a photoelectric cell. As the wheel turns, the film modulates the light intensity which is translated into varying voltages. These in turn cause appropriate fluctuations in the diaphragm of the listener's earphone (or in a speaker) so that he hears the message. CAA engineers call the unit "Baby Blabbermouth" because it's small and keeps talking.

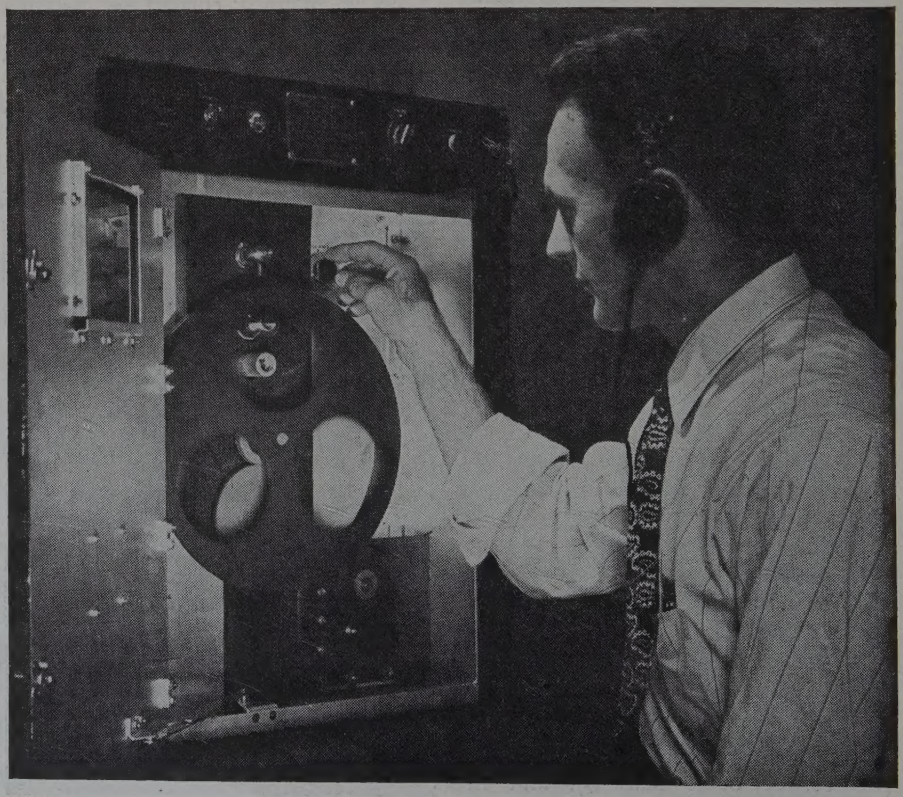
Installation Program for fiscal 1951-52

VOR (Omnirange stations):
- Dallas, Texas
- Long Beach, Calif.
- Oakland, Calif.
- Pittsburgh, Pa.
- Chicago Heights, Ill.
- New Orleans, La.
- Seattle, Wash.
- Kansas City, Mo.
- Montgomery, Ala.
- Cleveland, Ohio
- St. Louis, Mo.
- Bozeman, Mont.
- Caldwell, N. J.
- Cincinnati, O.
- Indianhead, Md.
- Boston, Mass.
- Jacksonville, Fla.
- Salt Lake City, Utah
- Minneapolis, Minn.
- Albuquerque, N. M.

FM (Fan Marker):
- LaHabra, Calif.
- New Rochelle, N. Y.
- Freehold, N. J.
- Beltsville, Md.
- Smyrna, Ga.
- Herndon, Va.
- Avon Lake, Ohio
- Moosup, Conn.
- Mt. Pleasant, Pa.
- Boothwyn, Pa.

LOM (Compass Locators):
- New York, N. Y. (LGA)
- Los Angeles, Calif.
- Chicago, Ill.
- Cleveland, Ohio

VOICE-CODE REPRODUCER—This device produces "talking identification" as well as Morse code identification on aeronautical radio ranges, markers. Voice is recorded on film stretched around edge of disk, is reproduced same way as motion picture sound



PRINTED IN THE U. S. A. BY THE CUNEO PRESS, INC.

PLANE FAX

Quick picture of

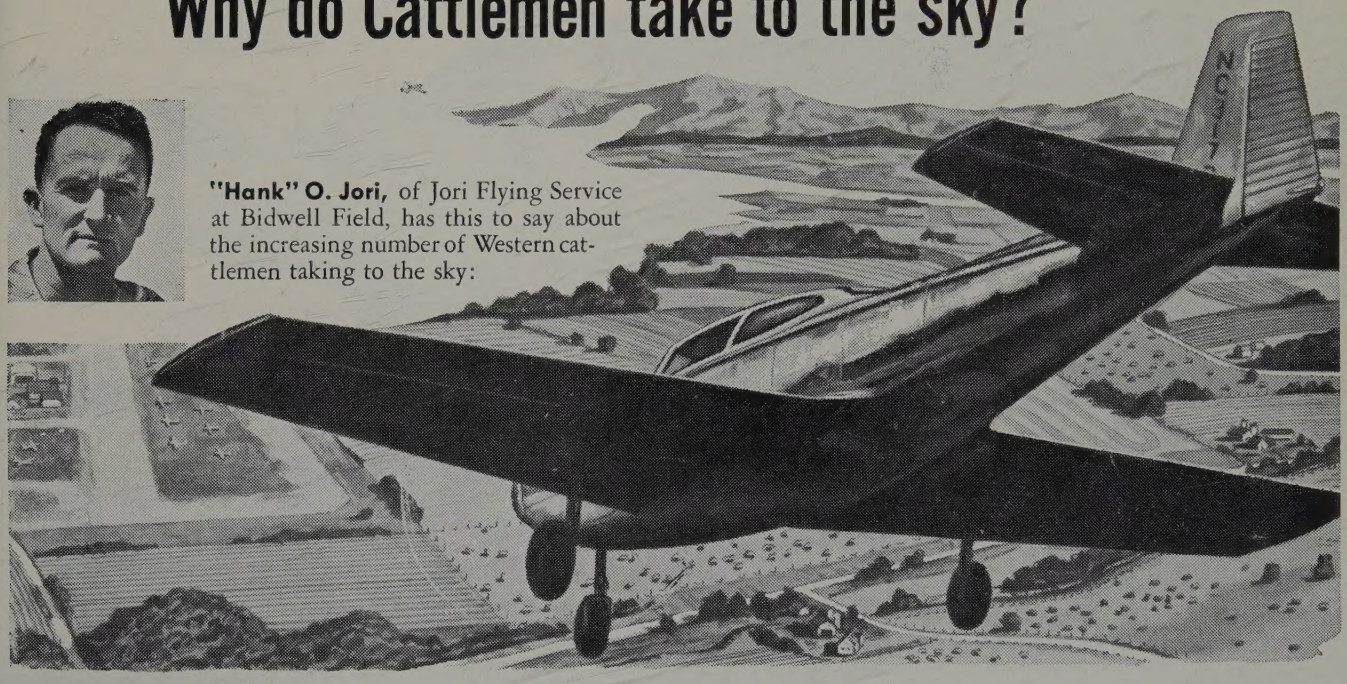
BIDWELL FIELD

Red Bluff, California

Surfaced 4000' runways, lighted on request after midnight. Weather and CAA communications. Limited hangar space, no tie-down fee. Snack bar. Free transportation to Red Bluff.

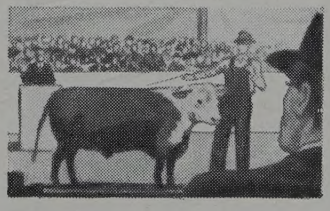
Why do Cattlemen take to the sky?

"Hank" O. Jori, of Jori Flying Service at Bidwell Field, has this to say about the increasing number of Western cattlemen taking to the sky:



"We're at the heart of big cattle country here in Red Bluff. In February, we'll hold the nation's top range bull sale—with more than 500 Hereford bulls on the auction block. Naturally, this sale attracts cattlemen from all parts of the West—with many cattlemen flying in from Texas, eastern Washington and other distant ranch areas that would require valuable travelling time by ordinary means of transportation. Last year, 20-odd private ranch planes came in for the sale.

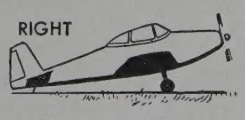
"We expect more ranch planes this year, because cattlemen are finding their planes pay in time and dollars saved. Air transportation lets a busy rancher fly in, make his bids, and be home again—often in a matter of hours.



"When it comes to servicing their planes, many wise cattlemen also agree on dependable Chevron 80/87 Aviation Gasoline and RPM Aviation Oil. They've discovered—in making it their *business* to fly—that they can always count on Standard Aviation products to give them *more* for their flying dollars."

T.M.'S "RPM," "CHEVRON," REG. U.S. PAT. OFF.

TIP OF THE MONTH



Make your pre-take-off engine run-up on a hard surface or on grass. Your prop will pick up pebbles from bare ground, and be nicked, necessitating an early refinishing of the propeller blade.

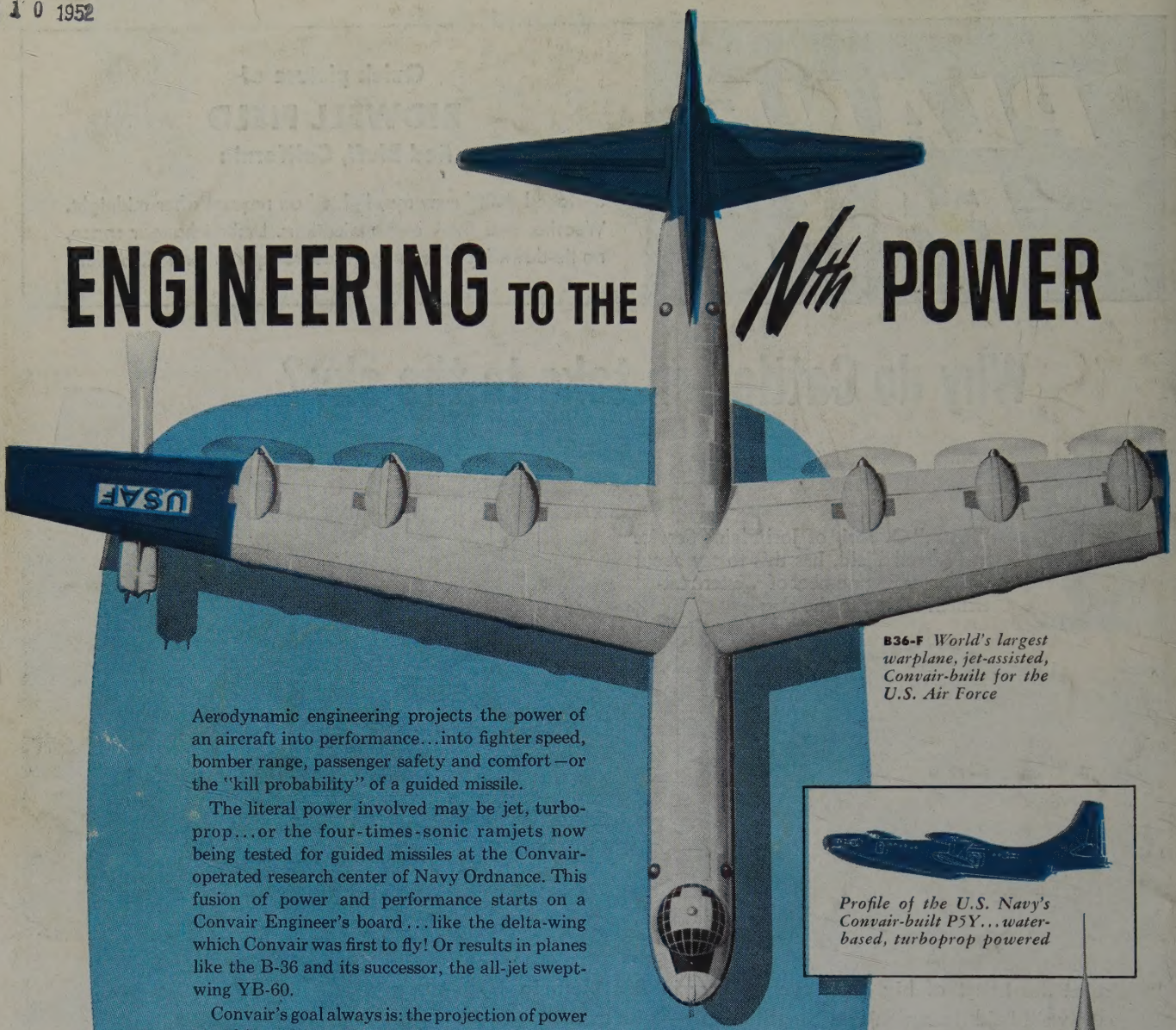
CHEVRON AVIATION GASOLINE

RPM AVIATION OIL

STANDARD OIL COMPANY OF CALIFORNIA

JAN 10 1952

ENGINEERING TO THE Nth POWER



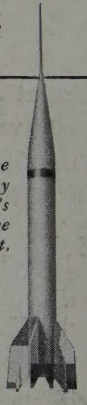
B36-F *World's largest warplane, jet-assisted, Convair-built for the U.S. Air Force*

Aerodynamic engineering projects the power of an aircraft into performance... into fighter speed, bomber range, passenger safety and comfort—or the "kill probability" of a guided missile.

The literal power involved may be jet, turboprop... or the four-times-sonic ramjets now being tested for guided missiles at the Convair-operated research center of Navy Ordnance. This fusion of power and performance starts on a Convair Engineer's board... like the delta-wing which Convair was first to fly! Or results in planes like the B-36 and its successor, the all-jet swept-wing YB-60.

Convair's goal always is: the projection of power to achieve the *maximum degree* of performance. The maximum, the Nth degree of air power... *the Nth Power!*

Profile of the U.S. Navy's Convair-built P5Y... water-based, turboprop powered



Guided missiles will be mass-produced by Convair in America's first exclusive missile plant.

IN THE AIR IT'S

CONVAIR

SAN DIEGO, CALIF • POMONA, CALIF. • FORT WORTH, TEXAS

Convair-Liner

unequalled for safety, preferred by passengers and pilots... more Convair-liners used by more airlines than any postwar plane!

CONSOLIDATED VULTEE AIRCRAFT CORPORATION